State Capacities in Latin America: Structural Transformations, Elite Competition, and Fiscal Development (1850-2010)

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ABSTRACT OF THE DISSERTATION

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Dissertation Director: Robert Kaufman, PhD.

My dissertation argues sectoral economic conflicts fostered state-building in Latin America. Using fine-grained historical case study comparisons, sectoral outputs from 1900 to the present, panel data and time-series econometric techniques, and a novel earthquake dataset (to measure state capacities), I find that industrial expansion altered the post-colonial political balance, putting heavy pressures for the implementation of tax institutions. In turn, fiscal expansion fostered both political development and economic growth.

Acknowledgements

I want to acknowledge the hard work, support and encouragement of my dissertation committee members, Bob, Dan, Paul and Doug. They read these essays a number of times, always providing very helpful, thoughtful and important comments. Their doors were always open to talk about this project. Thanks for the patience! A special mention goes to Jorge Bravo, who taught me how to be a dedicated hard-working grad student. I didn't start at Rutgers, but at Catholic University of Chile. They 'made' me a political scientist. A special recognition goes to my mentors back home, particularly, Juan Pablo Luna and Oscar Godoy. It is their 'fault' that I decided to stay in 'school' longer (or forever). Thanks also to Dave Armstrong, Will Jacoby, Johannes Karreth, Ryan Bakker, Paul Kellstedt, Mark Pickup, Chris Zorn and Sara Mitchell. All of them taught me the methods I used in this dissertation. They received me in their offices and answered all my questions both in the classroom or in some office in the Helen Newberry Residence during two long hot summers in Ann Arbor, MI. Thanks to Paulette Flowers-Yhap and Alicia Rodriguez-Picone. My staying at Rutgers was so much easier because of your help. You saved my life a number of times! Thanks to Ross Baker; he was my 'boss.' I am so luck to have TA'ed for him. When I have my own TAs, I will replicate your model, Ross. Arielle Bennet and I were co TAs. She taught me how to be a TA, and was always there for me when I needed to go to a conference, or have extra time to grade, etc. While Rick Lau, Dave Redlawsk and Jack Levy were not members of my committee, I learned so much from them. It was always good to have them around. Your doors were always open for me. A special mention goes to my fellow grad-students friends, Alp Tuncaci, Wei-Chi Chen, Tatsiana Kulakevich and Juliana Restrepo, who were my first friends I had at Rutgers. Later came Ecaterina Locoman and William Joung, and my officemates Andrew Greve, Noah Eber-Schmid and Tom Reilly. With all of them, we had so much coffee, cookies, drinks, chats. With all of them survived so

many presentations, homeworks and deadlines. So many times we wondered together about our future, our fears, dreams and doubts. With many of them fought together so many battles. I wish them all the best.

Dedication

This dissertation was possible thank to the love of my wife, Nicole Wirth, and our son, Tobias Bahamonde-Wirth. Nicole renounced to everything she had back home to come with me, and for that, these essays are dedicated to you.

It is also dedicated to my family, my dad, mom, and two sisters. The list is huge, but my grandparents, cousins, uncles, aunts, and godfather/mother require special mention. All of them are in Chile, and since we haven't been able to flight back home during all these years, we miss them very much. I hope we can see you all this year. Five years without all of you has proved to be a really hard thing to do. We've missed countless Christmas, birthdays and weddings. I hope in your eyes the sacrifice was worth it.

I want to say that my dissertation is also dedicated to the ones that I saw five years ago in this world for the last time without knowing it would be the last time. Having missed their last goodbyes is something that I will carry with me always. It hits twice as hard to learn the passing of your beloved ones, particularly, when you know you won't be there for them for the last time. Some of them left us too soon. I know my grandmother and my uncle see us from a better place.

This dedication can't be complete without a word about my friends and band mates, my 'foster brothers,' whom I left in Chile and who I miss very much. All the memories, those hot summers, the gigs, the cheap food and cheap drinks made a big part of who I am now. Miguel, Luis and Felipe, you guys don't know how much I miss our rehearsals, and I also dedicate all these efforts and sacrifices to all of you.

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Chapter 1

Introduction

1.1 Overview

In these three essays I intend to explain what the origins of fiscal expansion are, what the long-run economic consequences of fiscal expansion are, and what the consequences of fiscal expansion for state capacities are. I use two general theories, the *fiscal sociology* paradigm and the *dual sector* model. The first body of literature explains how a theory of income taxation allows for a theory of state-making, paying special attention to how conflicts among different economic groups inform the implementation of the income tax. The second literature explains that modern economic growth consists of mutual dependence of the agricultural and industrial sector. Taking the Latin American case, and particularly Chile as the main example, I use the next stylized facts as starting points:

- There were two economic sectors in Latin America, the agricultural and industrial sectors.

- Each economic sector had a corresponding political elite.

- Initially, the most important economic sector was agriculture, and the most important political elite were the landowning political elites.

- These two sectors were in permanent conflict. For instance, landowners governed in their own benefit, excluding industrial newcomers.

- However, the industrial class gained leverage as industrial output grew, challenging the institutional order.

I offer a *general theory of political development* centered around my three dependent variables: *fiscal expansion, economic growth* and *state-capacities.* Each dependent variable is object of the first, second and third essays, respectively. I find this analytical classification useful as each of these overarching topics are the key for any theory of political and economic development. The underlying theme on each of these topics is *sectoral conflicts* and *inter-elite inequality.* Specifically, I give special consideration to the next analytical constructs:

- The first players in the game are the agriculturalists. Given their initial more advantaged conditions, economic inequality is reduced when the industrial sector grows.

- Low inter-sectoral economic inequality translates into political elites with similar military capacities. High inter-sectoral economic inequality translates into military and political superiority.

- Actors cooperate when the opportunity costs of military conflicts are high. That is, when each group has similar military capacities. This happens when inequality is low. The opportunity costs also decreases when cooperation is associated with provision of public goods.

- The main act of inter-sectoral cooperation was the implementation of the income tax.

Finally, there is also a path-dependency component. *The income tax fostered political development when it was implemented early and under conditions of sectoral contestation.* Eventually, all countries considered in these essays implemented the income tax law. However, not all these countries are 'developed' countries. I make the case that this state-*making* institution fostered political and economic development only when its implementation was situated during the formative years of the nation, and when there were lower levels of inter-sectoral inequality. Both elements allowed the early incorporation of both elites into this foundational institution. If implemented during the formative period, the sectoral alliances that were required to implement the tax will

crystallized a series of reforms, replacing the old/colonial institutional order. In turn, late implementers lacked this foundational cleavage, leaving *intact* the old institutional order, compromising political and economic development in the long-run.

Analytically, my dissertation considers the next causal path:

- **High Capacity States**:

  - Low inequality led these two elites to seek compromises.

  - These compromises took place during the formative years of the state and during a period of structural indetermination, where no elite had a clear economic/military/political advantage (that is, where there existed low inter-sectoral inequality).

  - Since the income tax fosters state-*making* (fiscal sociology theory), in these cases, the subsequent state institutions reflected the preferences of both elites, crystallizing a new institutional order that fostered both political (fiscal expansion/first essay and state capacities/third essay) and economic development (economic growth, third essay).

- **Low Capacity States**:

  - High inequality prevented sectoral contestation, leaving the institutional order that was beneficial for agricultural elites untouched.

  - There was no need to make inter-sectoral compromises. The landed elites ruled in a monopolistic way.

  - While these cases did impose an income tax, its implementation was not situated during the formative years of the state.

  - There was structural *determination* (all actors knew that the landed elites governed, and would continue to do so). Consequently, the income tax did not reflect the foundational structural economic cleavage, crystallizing the institutional order inherited since colonial times.

1.2   First Essay

"**Sectoral Origins of Income Taxation: Industrial Development in Latin America and The Case of Chile (1900-2010)**" is the first essay, and it sets the stage for the next two essays. It provides the language, the scope, the assumptions and the (structural) epistemological approach. Using the fiscal sociology paradigm, it explains that the implementation of the income tax is an state-*making* institution. Empirically it suggests that the expansion of the industrial sector *accelerated* the implementation of the income tax.
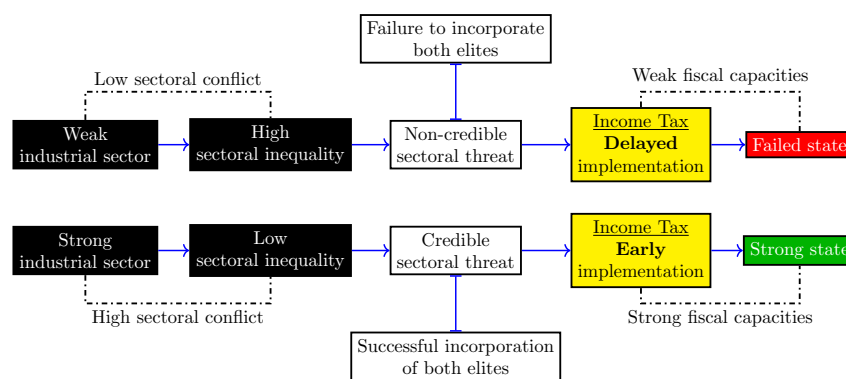
Figure 1.1: Causal Mechanism

The main argument is that early implementation of the income tax was more likely to occur when inter-sectoral inequality decreased, i.e. when the industrial sector expanded. As Figure 2.1 explains, when the income tax was implemented under politically contested circumstances, this institution expanded the overall state capacities by crystallizing a series of reforms, state services and other practices that replaced the old institutional order inherited in colonial times. Leveraging the fiscal sociology parading, I explain that the knowledge and expertise the state accumulated taxing incomes were transfered to other state institutions via spillovers, augmenting the overall levels of stateness.

1.3   Second Essay

"**Structural Transformations and State Institutions in Latin America, 1900-2010**" is the second essay. This essay builds on the first one, and *explores the economic consequences of income taxation under circumstances of sectoral contestation.* As Figure 3.1 depicts, when the income tax was implemented under contested circumstances, it modified the post-colonial institutional order, causing higher levels of state-building. This is the fiscal sociology theory, as explained before. However, I continue with the logical progression of the general argument and explain that this new institutional order, since it reflected the interests of the two main elites, fostered institutions that were appropriated for balanced economic growth (i.e. growth of the two sectors).
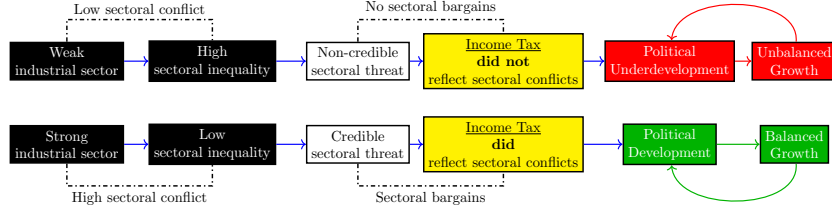
Figure 1.2: Causal Mechanism

In this essay I leverage the dual sector model of economic development:

- The industrial sector needs an efficient and productive agricultural sector to develop.

- Efficient agriculture frees labor and provides cheap foodstuff which the industrial sector can rely on. Constant supply of labor and food helps industries to expand at low costs. Thus, both sectors need one another to develop.

I consider this theory relevant not only for economic development, but also for political development. Balanced *economic* growth "balanced" the *political* leverage of both elites, leading to a state of political and economic equilibrium where no political elite was the main elite (backward arrows in Figure 3.1).

The econometrics are complex, and it has a number of moving parts. First, for every country I split the sample in two, before and after the implementation of the

income tax. For each of these two samples I compute country-specific Granger tests. I find that in "strong" cases, industry Granger-causes agriculture before the income tax. According to most of the development economics literature, this is considered *backwards* growth. Then, I find that agriculture Granger-causes industry after the income tax (modern growth). I interpret this as a reversal of the initial backwards/colonial institutional order. When the income tax was implemented under contested circumstances, this institution represented both elites, fostering state-building in a way that benefited both economic sectors, causing long-term economic growth. In "weak" cases the implementation of the income tax did not change the mechanics of growth accumulation: after the income tax, growth was still backwards, speaking to the maintenance of the backwards institutional order, which I interpret it is due to the lack of political contestation. Finally, after the directionality of growth is established, I use VAR models to establish the long-run economic equilibrium of "weak" and "strong" cases. Using impulse response functions (IRFs), I find that the relationships established in the Granger tests hold in the "strong" cases, suggesting long-term economic development.

1.4   Third Essay

"**Income Taxation and State Capacities in Chile: measuring institutional development using historical earthquake data**" is the third essay. Here I also build on the first and second essays. Unlike them, however, here I actually test the state-*making* effects of the implementation of the income tax theorized by fiscal sociologists.
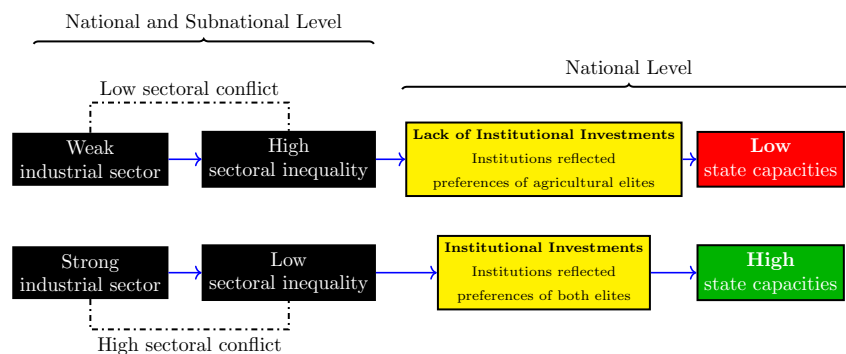

Figure 1.3: Causal Mechanism

I argue that higher levels of sectoral competition increased state-capacities over time. Specifically, I explain how the emergence of industrial elites lowered levels of inter-sectoral inequality, pushing the agricultural and industrial elites to reach agreements that materialized in investments in state-making institutions, causing in turn higher state-capacities. Exploiting the exogeneity of earthquake shocks, I leverage a novel intertemporal dataset on Chilean earthquake death tolls and a Bayesian multilevel Poisson model to account for state capacities between 1900 and 2010. Unlike the first and second essays, here I explain why and how it is important to account for subnational sources of sectoral contestation. I contend that the capacity the state has of enforcing and monitoring building codes throughout the territory is a reflection of its overall state capacities. Critically, local enforcement of nationally implemented laws required sectoral subnational compromises. To explore the causal mechanisms at work more deeply, I leverage the Chilean case, presenting some historical evidence showing that the rise of the industrial economic sector pushed agricultural and industrial political elites to invest in state-making institutions, particularly, the implementation of the income tax law. Local elites were willing to pay the income tax law in exchange of the delivery of local public goods. What my empirical analyses show is twofold. Death-tolls decrease, that is, state capacities increase, (1) when levels of sectoral contestation increase overtime, and (2) once the income tax law is implemented, finding support for the fiscal sociology paradigm, and particularly for the idea that direct taxation causes state-building.

Chapter 2

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

2.1 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

According to most political economists, fiscal sociologists, development economist and economic historians, fiscal capacities are a prerequisite for state-building. Unfortunately, there have not been many attempts to explain *why* and *how* state and fiscal capacities in the developing world emerged.[1] With a few exceptions, most efforts have been devoted to understanding the relationship between the politics of taxation and state capacities 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 research on Latin America has mostly focused

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[1] Di John [2006, 5].

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

on *recent* tax reforms.[3] However, the *origins* of the Latin American *fiscal* state remain relatively unclear. Additionally, since wars in Latin America have been rare,[4] it is difficult to extend models based on external threats originally developed to understanding the medieval European case.[5] Importantly, domestic explanations such as the role of sectoral conflicts within a context of economic structural transformation, taxation and state-building has been overlooked.[6] 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.[7] Building on the fiscal sociology paradigm, I propose that the development of the modern fiscal apparatus in Chile was product of sectoral conflicts and compromises that took place around in the 1920's 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 in an effort to generalize the theory. Using Cox proportional hazard regressions I model the *contribution* of each sector on the 'hazard' of implementing the income tax law. 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.

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

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[3]Fairfield [2013] studies different strategies policymakers pursue to tax elites starting in 1990. Mahon [2004] and Focanti et al. [2013] study the causes of tax reform in Latin America starting in the 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].

[5]Tilly [1992]. See also Besley and Persson [2009].

[6]For example, Schneider [2012, 2] argues that even when "[t]here has been significant attention given to the role of revenues in building early Western European states, and even some attention given to formative moments of state-building in developing countries [but] we have limited insight into what happens when economies change significantly, with new leading sectors, new patterns of social organization, and new requirements of state authorities."

[7]Wheeler [2011] studies how inter-elite cooperation and agreements positively impacted state-making in Europe.
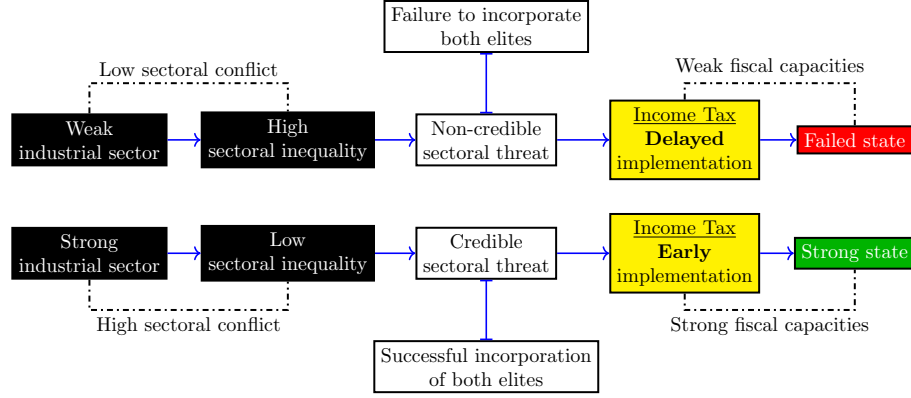
Figure 2.1: Causal Mechanism

interests of the landowning elites. However, the economic structural transformation characterized by "a secular decline of agriculture and substantial expansion of manufacturing"[8] imposed tight constraints on the way politics was run by the incumbent agricultural class. Given the initial advantage of the landed elites, the emergence of the industrial sector meant the reduction of inter-sectoral inequality. 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. 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. To explore the causal mechanisms at work more deeply, I present the Chilean case to show that industrial elites accepted to be income taxed by agriculturalist incumbents in exchange of having a more open political system and more state services. I explain that when the income tax was implemented under politically contested circumstances (as it happened in Chile), this institution expanded the overall state capacities by crystallizing a series of reforms

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[8]Johnston and Mellor [1961, 567].

that replaced the old institutional order inherited since colonial times. However, when the income tax was imposed late in history, its implementation did not reflect the *early foundational sectoral cleavage*, an important feature according to the fiscal sociology, truncating the development of state institutions. For example, Chile imposed the income tax law in 1924, and the *Servicio de Impuestos Internos* is among the finest tax institutions in Latin America. However, Guatemala imposed the income tax law very late, in 1963, and by 1967 the national income tax office employed 194 people, and only 9 of whom had graduated from college.[9] While Guatemala implemented the tax, the institution did not reflect the preferences of both sectors. In fact, the law responded more 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. These results go in line with Beramendi et al. [2016, 7] in 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.'[10] Consequently, the tax was not important because of the new revenue it collected,[11] but because its implementation required a series of sectoral 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. Crucially, the knowledge and expertise the state accumulated were transfered to other state institutions via spillovers, augmenting the overall levels of *stateness*. For example, leveraging historical earthquake data, Bahamonde [2017c]

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[9]Di John [2006, 5].

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

[11]Public economists usually focus on tax revenues. However, higher revenues do not mean higher stateness levels. For example, since American institutions were deliberately designed to limit the exercise of state power, the U.S. taxes very little (Fukuyama [2004, 6]). However, it is not reasonable to say that the U.S. has a "weak state." Moreover, high taxation levels do not necessarily imply higher levels of state capacities either. Kiser and Tong [1992, 301] explain that in the Ming (1368-1644) and Qing (1644-1911) China, higher taxes were in fact "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."

finds that the income tax increased the overall state capacities to reduce the death-toll of the average earthquake in Chile.

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. To explore the causal mechanisms at work more deeply, I present the Chilean case to show that industrial elites accepted to be income taxed by agriculturalist incumbents in exchange of having a more open political system and more state services. I explain that when the income tax was implemented under politically contested circumstances (as it happened in Chile), this institution expanded the overall state capacities by crystallizing a series of alliances and reforms that replaced the old institutional order inherited since colonial times. However, when the income tax was imposed late in history, its implementation did not reflect the *early foundational sectoral cleavage*, an important feature according to the fiscal sociology, truncating the development of state institutions. For example, Chile imposed the income tax law in 1924, and the *Servicio de Impuestos Internos* is among the finest tax institutions in Latin America. However, Guatemala imposed the income tax law very late, in 1963, and by 1967 the national income tax office employed 194 people, and only 9 of whom had graduated from college.[12] While eventually Guatemala did implement the tax, the institution was not product of a domestic endogenous inter-sectoral agreement. In fact, the law responded more 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. These results go in line with Beramendi et al. [2016, 7] in 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.'[13] Consequently,

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the tax was not necessarily important because of the new revenue it collected,[14] but because its implementation required a series of sectoral 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. Crucially, the knowledge and expertise the state accumulated were transfered to other state institutions via spillovers, augmenting the overall levels of *stateness*. For example, leveraging historical earthquake data, Bahamonde [2017c] finds that the income tax increased the overall state capacities to reduce the death-toll of the average earthquake in Chile.

This argument is situated within the broader literature on political and economic development. Particularly, the argument is situated within the broader fiscal sociology paradigm, emphasizing how fiscal development was important for state-making. And while some scholars situate the relevant state-building critical juncture at the end of the colonial period, before the class compromises I identify in this paper. For example Kurtz [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." Both critical junctures happened *before* 1900. While the process of state-building started before 1900, the paper identifies the income tax as an important *additional* building block in that process.

2.2 Taxation and State Formation

According to the fiscal sociology approach, the great modern innovation was not the rise of capitalism (Marx) nor the rise of modern bureaucracy (Weber), but the rise

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[14]Public economists usually focus on tax revenues. However, higher revenues do not mean higher stateness levels. For example, since American institutions were deliberately designed to limit the exercise of state power, the U.S. taxes very little (Fukuyama [2004, 6]). However, it is not reasonable to say that the U.S. has a "weak state." Moreover, high taxation levels do not necessarily imply higher levels of state capacities either. Kiser and Tong [1992, 301] explain that in the Ming (1368-1644) and Qing (1644-1911) China, higher taxes were in fact "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."

of the "tax state," which developed institutions to penetrate individual economies.[15] It was Schumpeter who called for a systematic study of public finances, and to treat taxation both as cause and consequence of large-scale changes in the structure of the economy and the state.[16] I use this framework to contend that the expansion of the fiscal system embodied especially in the implementation of the income tax was the spring of the political structural transformation that took place around in the 1900's. Faster industrial output nurtured a new demanding political elite, leading to a string of institutional investments, setting countries in a long-term path of institutional development. I agree with Musgrave [1992, 99]: since taxation (especially on incomes) requires such a high degree of state penetration, public finances offer the key for a theory of state development.

The fiscal sociology paradigm is vast.[17] Without trying to survey all of it, this paper follows the classical approach famously suggested by Schumpeter in that it sees "taxation in terms of group conflicts [and] class interests."[18] Similarly, Seligman in 1895 argued that "[f]iscal conditions are always an outcome of economic relations,"[19] while Goldscheid in 1925 famously argued that "tax struggles are among the oldest forms of class struggle."[20] This paper is situated within this classic tradition, emphasizing the sectoral conflicts between agricultural and industrial elites in Latin America. As others have argued, political development and particularly "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."[21] Since state centralization affects

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[15]Moore [2004b, 298]. See epigraphs (Schumpeter [1991, 100] and Lewis [1965, 42]). This argument has been famously developed by Levi [1989] as well.

[16]Martin et al. (in Martin et al. [2009, 2]). See also Schneider [2012, 35] who argues that "[p]ublic finances are causal and symptomatic. Revenues are necessary to build states; the act of gathering revenues structures societies; productive societies and capable states generate revenues."

[17]For an excellent overview of both classic and new fiscal sociology refer to Martin et al. [2009, Ch. 1].

[18]Monson and Scheidel [2015, 14].

[19]In Martin et al. [2009, 7].

[20]In Campbell [1993, 168].

[21]Hechter and Brustein [1980, 1085]. Emphasis is mine

landowners and industrialists in different ways,[22] this approach is especially relevant for the Latin American case. Agriculturalists systematically resisted taxation as land fixity increased the risk premium of their main asset,[23] while industrialists' preferences toward taxation were more elastic as capital could be reinvested in nontaxable sectors.[24] Taxation has always been conflictual since it has an important coercive element. As Martin et al. argue "a tax is not a fee paid in direct exchange for a service, but rather an obligation to contribute."[25] What makes taxation relevant, conflictual and coercive is not the tribute itself (and the potential promise of provision of public goods), but its compulsoriness. Regardless of an individual's race, religion, culture or any other kind of status, the state classifies its subjects according to their incomes and oblige them to pay, punishing whoever refuses to do so. From a sociological standpoint, this "generality makes taxation a crucial element in the development of the 'imagined community' (Anderson [2006]) [...] Taxation enmeshes us in the web of generalized reciprocity that constitutes modern society."[26]

Not all kinds of taxes have the same level of positive impact on state-building. Indirect taxes do not need to develop a strong fiscal apparatus.[27] According to Best [1976, 53], "indirect taxes are but substitutes for direct taxes,"[28] and hence they are typically administered by weak states.[29] Since indirect taxes are, *ceteris paribus*, easier

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[22]Acemoglu and Robinson [2009, 289].

[23]Robinson [2006, 512].

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

[25]in Martin et al. [2009, 3].

[26]Martin et al. (in Martin et al. [2009, 3]).

[27]However, 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.

[28]However, 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.

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

to levy,[30] this kind of revenue is generally considered "unearned income"[31] or "easy-to-collect source of revenues."[32] Given the relatively lower costs states have to incur to collect them, indirect taxes 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.[33] Since customs administrations in the region have always been concentrated in a few critical locations, eespecially ports, tariffs and customs duties did not require an elaborate fiscal structure.[34]

Direct taxes are more likely to produce long-lasting positive effects on state-building. Since direct taxation involves a compulsory transfer from private hands to the government sector for public purposes,[35] it is harder to collect,[36] requiring stronger domestic alliances to sustain these kinds of policies. Following the fiscal sociology paradigm, in this paper I focus on the income tax. 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."[37] Since taxing incomes involves transforming private income into public property,[38] this form of taxation demands the endogenous development of both stronger state institutions and efficient monitoring and enforcement technologies.[39] As others have pointed out, "administrative constraints are identified as the main constraint to the ability of states to collect [the] income tax."[40] Political alliances should exist to overcome these logistic, institutional and political domestic challenges. Critically, economic elites, should agree to comply with the income tax.[41]

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[30]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."

[31]Moore [2004b, 304].

[32]Coatsworth and Williamson [2002, 10].

[33]Campbell [1993, 177].

[34]Bertola and Ocampo [2012, 132].

[35]*Cfr.* Raja Chellia, "Trends in Taxation in Developing Countries," in Migdal [1988, 282].

[36]Kurtz [2013, 62].

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

[38]Musgrave [1992, 98].

[39]Lieberman [2002, 99].

[40]Di John [2006, 5].

[41]Best [1976, 71] argues that the "actual composition of taxes can be viewed as dependent upon the

Beramendi et al. [2016] argue that in fact Latin American "capitalist elites [*preferred*] to shoulder a higher tax burden through progressive direct taxation, which they [viewed] as the least-worst economic option," fostering fiscal expansion.[42] Firstly, I contend that an elite divided on an *economic* cleavage should be at the same time divided on their *political* preferences, particularly regarding their attitude towards state centralization.[43] Elites split along economic interests should then use state power to influence the institutional order in different ways. Secondly, I contend that since tax revenues depend upon the interests of different classes as they attempt to use state power for their own purposes,[44] class conflicts are more likely to resolve in favor of direct taxation where income inequality *among the elite* is low.[45]

As depicted in Figure 2.1, here I focus on how 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. Given that similar degrees of sectoral economic development can be converted into armies of similar capabilities,[46] elites will have incentives to make agreements rather than engaging in conflict when their economic/military capacities are similar. For instance, in the next section I explain how equally powerful elites managed to seek and get support of different branches of the military. Analytically, lower levels of inequality forced cooperation by generating credible military threats to the incumbent elites. Furthermore, when levels of inter-elite inequality were low (and military resources were more accessible for both elites), war was more likely to exhaust all existent assets without producing positive outcomes for either sector,[47] increasing the opportunity costs of conflict.

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distribution of power rather than as an expression of the free choice of the majority of the people."

[42]They particularly argue that progressive taxation is better relative to "trade taxation, which can negatively impact the industrial sector" (p. 18).

[43]See for example Llavador and Oxoby [2005].

[44]Best [1976, 50].

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

[46]Boix [2015].

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

2.3   Unpacking the Mechanisms: Chile 1850-1950

To provide some historical context, in this section I present the Chilean case. As an economically and socially developed example,[48] this case should be able to show the inter-sectoral dynamics that fostered institutional development. Particularly, this section shows how the emergence of the industrial sector reduced inter-elite inequality, generating credible threats to the agricultural landowners and promoting sectoral agreements. I pay special attention to the conditions that led to the implementation of the income tax law.

Historians still debate whether agriculturalists and industrialists comprised two *different* elites. Some claim that this dualism is incorrect.[49] They argue that since landowners also invested in industry,[50] there was a blurry class division between the mining, banking and agricultural sectors.[51] I contend that there are a series of facts that suggest that there was indeed a structural fracture 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 state. 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."[52] In fact, this practice shows how the credit system was oriented to give unfair advantage to the landed elites. 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* of [the elites'] actors.'[53] There were

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[48]Mahoney [2010, 5].

[49]See for example Mamalakis [1976, 125].

[50]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."

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

[52]Emphases are mine.

[53]Emphasis is mine.

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.'[54] And finally, Bahamonde [2017a] explains how the dual *structure* of the economy was *incompatible* with a fully diversified investment portfolio. Concretely, he shows how in some developed Latin American cases the structure of the economy was designed to allocate resources *from* the land *to* the industries, suggesting a situation of sectoral distinctiveness.

In all Latin American economies during and right after the colonial period, agriculture was the most important sector.[55] And by extension, the economic interests of the agricultural elite were the only economic interests represented in politics.[56] 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."[57] 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.[58]

There existed an important asymmetry. While the industrial sector was growing, they were kept from participating in politics with the same privileges and conditions landowners had. Consequently, it was easy for the agricultural elite to produce policies that were designed to enhance their sector. Zeitlin [1984, 13] argues that "landowners controlled both the vote and the labor power of the agrarian tenants (*inquilinos*) and

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[54]Emphasis is mine.

[55]Keller [1931, 13].

[56]Wright [1975, 45-46].

[57]Similarly, McBride [1936, 15] explains that "Chile's people live on the soil. Her life is agricultural to the core. *Her government has always been of farm owners. Her Congress is made up chiefly of rich landlords.* Social life is dominated by families whose proudest possession is the ancestral estate." Emphases are mine.

[58]Bahamonde [2017a].

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,[59] leaving the modern sector heavily under-represented.[60] Consequently, fiscal pressures in favor of agricultural taxes were minimal compared with mining taxes,[61] leaving the agricultural sector systematically - and substantially - undertaxed relative to other sectors.[62] 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."[63] For example, the little public infrastructure that existed benefited the agricultural sector.[64]

For nearly 400 years, mining was the most important activity outside of agriculture. Eventually, the mining sector failed to catch up with more efficient technologies better suited to exploit low-grade ores,[65] and collapsed. After the mining boom, mining elites shifted their focus to what is considered the first *true* industrial work which began under agricultural auspices: the cotton mills.[66] The first industries were called *obrajes* and beyond textiles, early industrialists processed other agricultural goods.[67] The industrial

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[59]Bauer [2008, 45].

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

[61]As explained, mining 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.

[62]Best [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 cooper - 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."

[63]Bauer [2008, 118].

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

[65]Kirsch [1977, 53].

[66]See Rippy [1971, 231]. As Bethell [1986, 271] argues, "[t]he first power looms were brought [in Perú, Ecuador, and Venezuela] in the 1840s, 1850s; but in all three they were a failure, some of the early mills in Ecuador being destroyed by an earthquake. It was not until after 1890 that the textile industries of these nations began to operate with reasonable success. Guatemala's first cotton mill was established in 1882, and between that date and 1910 a few mills appeared in Chile, Argentina, Uruguay, and Colombia."

[67]For example, animal grease and tallow, dried and cured meats, flour, bread, beer, wines and spirits, being most of them for domestic consumption (Bethell [1986, 272]). Sugar was used in the production of chocolate, candies and biscuits (Bertola and Ocampo [2012, 129]).

sector was boosted by favorable international conditions, many times stimulating a positive complementarity between the two sectors. Industrial activities started very small,[68] progressing "from the shop to the factory during the latter half of the nineteenth century."[69] Importantly, modern industrialization did *not* begin with ISI, but around 1900. Bertola and Ocampo [2012, 129] find that the "fact that manufacturing was alive and thriving in Latin America before the 1929 crash is now beyond question." Similarly, Haber [2005, 2] finds that the "development of large-scale, mechanized (and even "heavy") industry can be dated back to the 1890s."[70]

In Chile, the industrial elite was composed by an incipient, yet strong and cohesive group of individuals. Historian Francisco Encina explains that the members of the non-agricultural class were 'not only close associates, or drawn from the same family, but they were the same individuals.'[71] In the process of going from mineowners to proto-industrialists, this incipient elite developed a strong sense of social *class*.[72] Sectoral interests were organized as follows. The *Sociedad de Fomento Fabril* (SOFOFA) was founded in 1883 to represent the interests of the the industrial sector against the interests of the agricultural sector, represented by the *Sociedad Nacional de Agricultura* (SNA), founded 45 years earlier. The SNA "was the most powerful associational interest group in nineteenth-century Chile,"[73] and according to Wright [1975, 51], it clearly thought of itself as a social class. By the 1920s, industrialists started to "form trade associations to engage in lobbying and propaganda as more coherent interest groups."[74]

Both economic sectors were similarly developed but only agriculturalists had access

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[68]Marichal [1989], Rippy and Pfeiffer [1948, 68].

[69]Rippy [1971, 235].

[70]For example, Rippy and Pfeiffer [1948] and Pfeiffer [1952] explain that by the 1870's the carriage industry was on a firm basis.

[71]In Zeitlin [1984, 30], emphasis in original. He describes several last names which are still associated with the Chilean elite, such as Ossa, Edwards, Vicuña Mackenna, Matta, Goyenechea, Cousiño, Urmeneta, Gallo and Subercasaux. Emphasis in the original. Similarly, Wright [1975, 48] supports the thesis that nitrate development led to the development of an "incipient industrial establishment."

[72]Kirsch [1977, 41] explains that the founding of the SOFOFA clearly reflected a "tension created by the *awareness* of the incongruence between the actual exploitation of economic forces and the potential that could be extracted from them through industrialization," emphases are mine.

[73]Wright [1973, 244].

[74]Weaver [1980, 107].

to fair political representation. This asymmetry led these two 'antagonistic elites'[75] to confront in the civil wars of 1851-1859 and 1891 between a "large landed property [elite against a] productive capital [elite]."[76] 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.[77] While his agenda on "industrial" infrastructure (mainly roads and railroads) benefited mostly agricultural areas,[78] his attitude towards the banking sector (closely linked to the mining sector)[79] was 'all but confiscatory.'[80] 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 "landed proprietors [to] become dependent to a considerable extent on the continuing prosperity of the major nitrate capitalists."[81] He explains that while biased investments against the industrial class played an important role, the sectoral economic dependence between the two sectors was the major factor that mobilized both elites into the civil war of 1891. Ultimately, this case illustrates the sectoral economic conflicts between the two elites. While it would be inaccurate to say that Balmaceda was *completely* supported by agriculturalists and *completely* opposed by industrialists, this example illustrates how (failed) inter-sectoral alliances and biased public goods provision against industrialists led these two groups to a military conflict in 1891. Lower levels of inter-elite inequality gave both elites access to military resources. While *Balmacedistas* managed to secure support with of army, *congresistas* (the anti-Balmaceda group) managed to gather support of the navy.

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[75]Keller [1931, 37-38].

[76]Zeitlin [1984, 23].

[77]Zeitlin [1984, 186].

[78]Zeitlin [1984, 124].

[79]Zeitlin [1984, 118].

[80]Zeitlin [1984, 175].

[81]Zeitlin [1984, 129].

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,[82] 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 a 'parliamentary' system came from the conflicting elites themselves.[83] 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,"[84] there were a number of amnesties issued. Similarly, there were a number of *aborted* coups in 1907, 1912, 1915 and 1919.[85] 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.[86] Three institutional components were considered: an income tax, industrial protectionism, and equal access to the state. Here I focus on the first component.[87] 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."[88] Beramendi et al. [2016] also find that investments in fiscal capacities are conditional on the expansion of the industrial sector.

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[82]Zeitlin [1984, 86].

[83]Collier and Collier [2002, 108].

[84]Zeitlin [1984, 87].

[85]Collier and Collier [2002, 109].

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

[87]The 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].

[88]Similarly, 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,[89] who was supported by 'the dominant political and landed aristocracy.'[90] Governability was seriously compromised as the election let the senate in control of the landowning class, who roundly opposed tax reforms.[91] Particularly, the opposition had 'serious differences [...] over [Alessandri's] legislative program, eespecially in connection with the proposed income tax.'[92] Eventually, 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.*"[93] 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.[94] 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."[95] In turn, the military was concerned with the general budget situation. Salaries of army and navy officers 'were two months in arrears.'[96] Famously, on September 3 of 1924 young officials attend the galleries of the senate and made noise with their sabers to demonstrate their discontent. After the resignation of the entire cabinet, president Alessandri sided with the army in an effort to accelerate the implementation of several pieces of legislation that have been blocked by congress for months.

The implementation of the income tax in Chile was associated with the implementation of other state institutions, expanding the bureaucratic *dominion* of the state. However, unlike other 'regular' state institutions and services, taxing incomes in fact infiltrated the state's coercive sovereignty unto the individual itself. It was the practice

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[89]Collier [1999, 111].

[90]Haring [1931, 2].

[91]Haring [1931, 5].

[92]Haring [1931, 3].

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

[94]James [1924, 552].

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

[96]Haring [1931, 6].

of this technology that gave the state the big push allowing the reproduction of its power in other areas throughout the territory. Following the fiscal sociology paradigm, I contend that the more effectively the state taxed its subjects, the more knowledge accumulated performing *other* state activities. The knowledge and expertise the state accumulated were transfered to other state institutions via spillovers, augmenting the overall levels of *stateness.* For instance, it was necessary to send official emissaries to check on accounting books of the refinery in the north, the winery in the central valley and the *hacienda* in the south. Eventually, these delegations became more complex, increasing the density of state presence in the territory. For instance, Strayer [2005] explains how official state delegations traveled the territory dispensing judicial decisions, fostering state centralization. Bahamonde [2017c] finds that the conflict over the implementation of the income tax generated alliances with subnational elites, fostering sustained state-capacities throughout the territory. Also, part of its effectiveness can be explained in that (1) elites carried a big chunk of the burden, and that (2) the most influential economic groups agreed on the implementation of the tax.[97] In fact, Bergman [2003] explains that Chile is one of the few successful cases of tax compliance in Latin America.
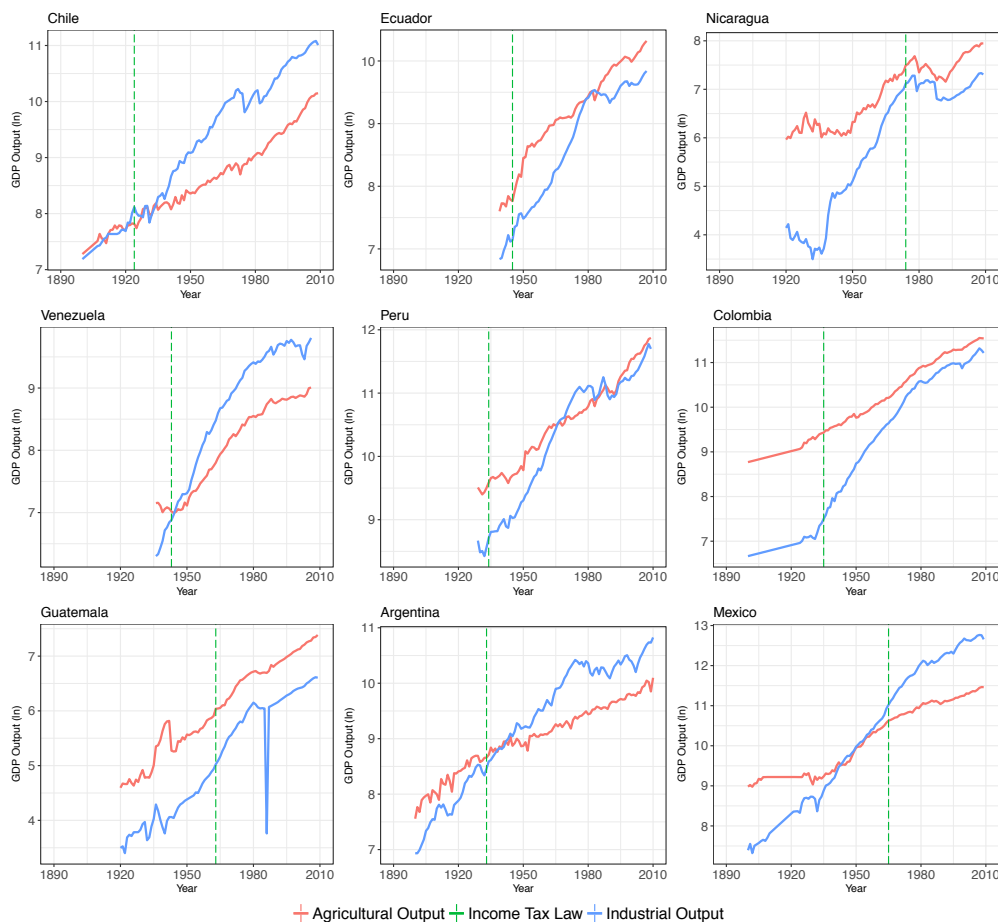
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[97]Beramendi et al. [2016].

Figure 2.2: Industrial and Agricultural Outputs, and The Passage of the Income Tax Law

2.4 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 challenged incumbent landowners by using industrial and agricultural sectoral growth rates as presented in the MOxLAD data.[98]

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[98] "These data build on the studies and statistical abstracts of the Economic Commission for Latin America, but also rely on Mitchell's International Historical Statistics, International Monetary Fund's International Financial Statistics, the World Bank's World Development Indicators and a variety of national sources." I used the *agriculture value-added* and *manufacturing value-added* variables. The

The dataset spans from 1900 to (potentially) 2010.[99] According to Astorga et al. [2005, 790], these data provide extended comparable sectoral value-added series in constant purchasing power parity prices.[100] Using secondary information, Table 6.1 states *when* the income tax was implemented, which was the specific law, and its corresponding source(s). Figure 2.2 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,[101] and consequently the tax base, I include total country-year population as a control variable.
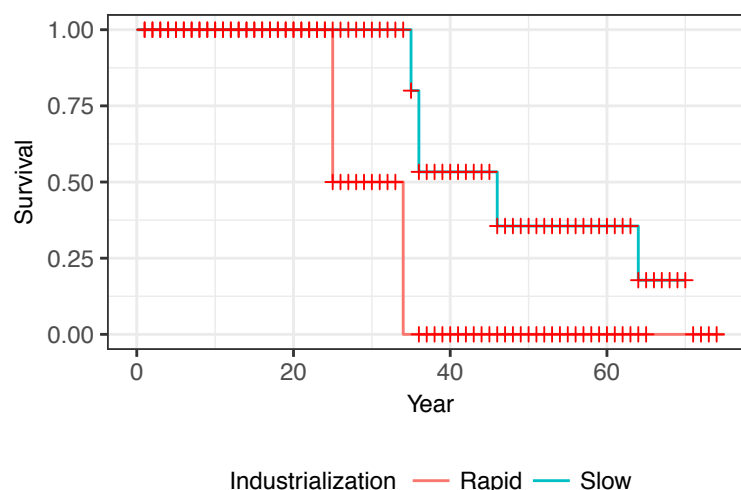
Figure 2.3: Kaplan-Meier Curves: Size of the Industrial Sector and the Accelerated Rate of the Imposition of Income Tax Law

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. The occurrence of the outcome of interest (taxation) should not be directly

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.

[99]As 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.

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

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

related to time itself, but to the rise of the industrial elite. Within the framework of survival analyses, Figure 2.3 shows the failure rate of the sample average country of implementing the income tax if industrial development had increased/decreased by half ('rapid'/'slow').[102] The figure strongly suggests 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 2.2 shows 5 models. [103] 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.[104] 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)[105] or "the use of the natural log transformation [to capture] different forms (or "shapes") of the baseline hazard,"[106] 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.[107] This method is especially well suited to binary data.[108] 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

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[102]'Failure' in this case means 'implementing' the income tax law.

[103]All 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 LaTeX using the dynamic report R package `knitr` (Xie [2016]), for fully replicable research. The simulations were performed using the `simPH` R package (Gandrud [2015]).

[104]I do not combine both variables nor do I construct an index. Since I am interested in the *contribution* of each individual sector in the acceleration of the implementation of the income tax law (keeping constant the other), keeping both variables separately is a better strategy. See Figure 2.4.

[105]Wawro [2002].

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

[107]Zorn [2006, 322].

[108]Hanley et al. [2003].

structure,"[109] 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.[110] 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.[111] A number of scholars rightly argue that post-colonial state capacities are in part a function of pre-colonial state-capacities.[112] Fixed-effects should be able to account for this and other unobserved or hard-to-measure covariates, which if left unaccounted for, would introduce omitted variable biases.[113] Model 5 accounts for possible spatial-temporal dependence.[114] Given that most of the countries I am modeling are contiguous neighbors, it is reasonable to expect a "domino" effect. 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.[115]

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

[110]Hardin and Hilbe [2013, 166] explains that if "the number of panels is small, then the independence model may be the best; but [analysts should] calculate the sandwich estimate of variance for use with hypothesis tests and interpretation of coefficient," which is what I report in Table 2.2.

[111]I thank Matthias vom Hau for this suggestion.

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

[113]Angrist and Pischke [2008].

[114]I thank both Christopher Zorn and David Darmofal for this suggestion.

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

All in all, the 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).
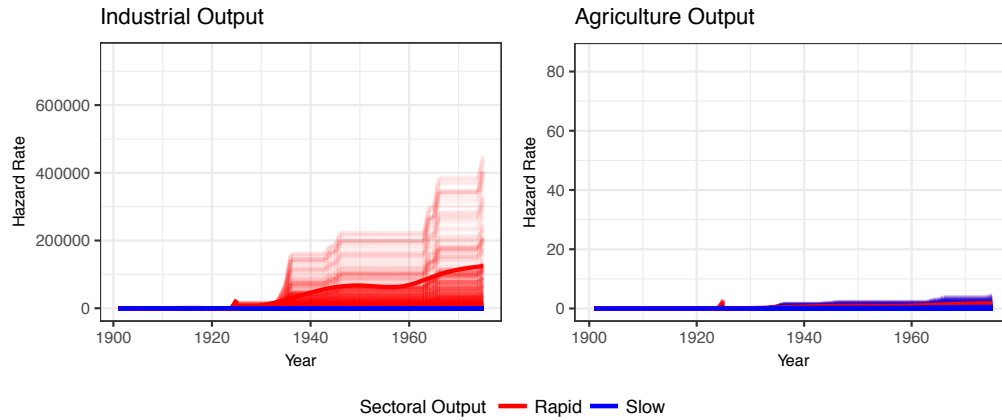

Figure 2.4: Hazard Rates of Implementing the Income Tax Law

Using the estimations from Model 1 in Table 2.2, I follow Gandrud [2015] and King et al. [2000], and in Figure 2.4 simulate 1000 times the Hazard Rate of implementing the income tax law conditional on industrial and agricultural growth rates.[116] While the outcome of interest does *not* depend *directly* on time,[117] sectoral outputs do grow in time.[118] Consequently, it will be necessary to account for this tendency by allowing estimations to vary with time as well.[119] Since the Hazard Rate "is the probability that a case will fail at time t,"[120] I take advantage of this quantity of interest which allows some dependency on both time *and* the covariates.[121] Figure 2.4 strongly suggest that the faster the agricultural sector develops, the less likely the implementation of

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[116]Box-Steffensmeier and Jones [2004, 15] explain that the Hazard Rate is the most common quantity of interest analysts focus on. Figure 2.4 shows 90% confidence intervals.

[117]Please refer to Figure 2.3.

[118]Please refer to Figure 2.2.

[119]The economics literature refers to these kinds of time series 'integrated' or I(1) processes.

[120]Licht [2011, 231].

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

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. The stronger the industrial sector, the faster the tax is implemented.

These results suggest that given the initial advantage of the landed elites, the secular emergence of the industrial sector also meant the reduction of inter-sectoral inequality, generating political, economic and military threats to the landed elites, which materialized into sectoral agreements, particularly, the implementation of the income tax law. From a substantive point, *when* countries implement their income taxes is an important factor for state development. Particularly, *early* implementation of the income tax situated the conflicts and eventual sectoral agreements about the tax during the formative national periods. In contrast, *late* implementers adopted this state-*making* institution due to exogenous factors that did not necessarily responded to the sectoral economic cleavage. Finally, analyzing the sectoral *contribution* on fiscal expansion suggested to be a fruitful exercise. These results suggest that only industrial expansion *accelerates* the implementation of the income tax. Critically, agricultural expansion *delays* it.

2.5   Discussion

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, and leveraging historical evidence I find that industrial elites accepted to be income taxed by agriculturalist incumbents in exchange of having a more open political system and industrial tariffs. 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 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 that replaced 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 findings are situated within the broader literature on political and economic development, particularly within the fiscal sociology paradigm, emphasizing how fiscal development was important for state-making. Concretely, this paradigm proportionates a theory of state-building as it links the mechanics between the state 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 in the continent. To the best of my knowledge, Beramendi et al. [2016] and this paper are among the few of such accounts.[122]

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[122]In 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.'

Country	Available Data	Year Income Tax	Law	Source
Chile	1900 - 2009	1924	*Ley* 3996	Mamalakis [1976, 20] and LeyChile.Cl (official)
Peru	1929 - 2009	1934	*Ley* 7904	Gobierno del Perú [1934] (official)
Venezuela	1936 - 2006	1943	*Ley* 20851	*Gaceta Oficial* (official) and Ventura and Armas [2013, 27]
Colombia	1900 - 2009	1935	*Ley* 78	Figueroa [2008, 9]
Argentina	1900 - 2010	1933	*Ley* 11682	Infoleg.Gob.Ar (official)
Mexico	1900 - 2009	1965	*Ley de Impuesto sobre la Renta*	Díaz González [2013, 130-133] and Diario Oficial (official)
Ecuador	1939 - 2007	1945	-	Aguilera and Vera [2013, 135]
Nicaragua	1920 - 2009	1974	*Ley* 662	Legislacion.Asamblea.Gob.Ni (official)
Guatemala	1920 - 2009	1963	*Decreto* 1559	Instituto Centroamericano de Estudios Fiscales [2007, 165]

Table 2.1: Sample, Data Available and Year the Income Tax was Implemented

	Cox (1 lag)	Cox (1 lag, ln)	Logit GEE	Conditional Logit (FE)	Spatial Dependence
Manufacture Output$_{t-1}$	1.451*				
	(0.569)				
Agricultural Output$_{t-1}$	-0.859				
	(0.740)				
Total Population	-0.000***				
	(0.000)				
Manufacture Output$_{t-1}$ (ln)		1.279˙			
		(0.710)			
Agricultural Output$_{t-1}$ (ln)		-0.819			
		(0.788)			
Total Population (ln)		-0.844	0.065	1.012*	-0.842
		(0.531)	(1.219)	(0.405)	(0.830)
Manufacture Output (ln)			1.543***	0.970***	1.277
			(0.333)	(0.161)	(1.036)
Agricultural Output (ln)			-1.107**	-1.185***	-0.818
			(0.369)	(0.292)	(1.071)
AIC	22.788	25.093		4135.812	25.091
R^2	0.021	0.013		0.392	0.013
Max. R^2	0.078	0.080		0.995	0.078
Num. events	9	9		570	9
Num. obs.	281	272	842	842	281
Missings	0	0		0	0
PH test	0.937	0.722			0.217
Num. clust.			9		

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

Table 2.2: Sectoral Origins of Income Taxation: Income Tax Law and Industrial Development

Chapter 3

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

3.1 Sectoral Conflicts and Development

> *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 political and economic development is vast. Without trying to survey all of it, there seems to be an agreement in that strong institutions cause better economic performance. For example North [1990, 3] asserts that the idea that "institutions affect the performance of economies is hardly controversial." However, most explanations focus property rights protection.[1] I find that this is a limitation since regimes that do not respect property rights (for example, dictatorships) grow at levels that sometimes even surpass democratic countries. While I still think that institutions matter for economic growth, this paper seeks to contribute to this literature by introducing an additional channel, particularly, emphasizing the role of sectoral conflicts on political and economic development. I build on the *fiscal sociology* paradigm to argue that fiscal institutions, which are the engine of state-*making*, are product of a sectoral conflict. In turn, borrowing from the *dual sector* model I document how the secular structural transformation (i.e. the gradual emergence of the industrial sector) triggered a major political transformation reversing the backward institutional order

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[1]Johnson and Koyama [2016].

implemented since colonial times (and sustained by the landowning class), producing long-term balanced economic growth. More generally, this paper explains how political development is associated with economic growth. I use sectoral outputs from 1900 to 2009 to proxy the emergence of the industrial sector in a number of Latin American countries,[2] vector autoregressive models (VAR), Granger-causality tests, impulse response functions (IRFs) and the Chilean case to illustrate the causal mechanisms. The results suggest that long-term economic development is channeled through sectoral contestation and institutional investments, particularly the expansion of the fiscal system.

The political development literature has traditionally focused on socio-economic cleavages and potential alliances between a *homogeneous* ruling elite and politically excluded segments of the society, traditionally peasants or other disenfranchised groups such as 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] In this paper I focus on political divisions *among* the elite. The elite-sector approach is hardly new. Just to mention some examples, 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," Mares and Queralt [2015] examine how income taxation in Europe is associated with inter-elite conflicts, particularly between the landed elite and the industrial elite. While political economists have already recognized the relevance of sectoral conflicts and the structure of the economy, the focus has been on democratic development. Using the same sectoral approach as a starting point, the paper stresses how these structural conflicts are associated with institutional and economic development.

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[2]The actual data availability might vary by case.

[3]For 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 preferences over democracy of industrialists and agriculturalists. An alternative to the 'bargaining' model is the 'compelling' model proposed by Boucoyannis [2015].
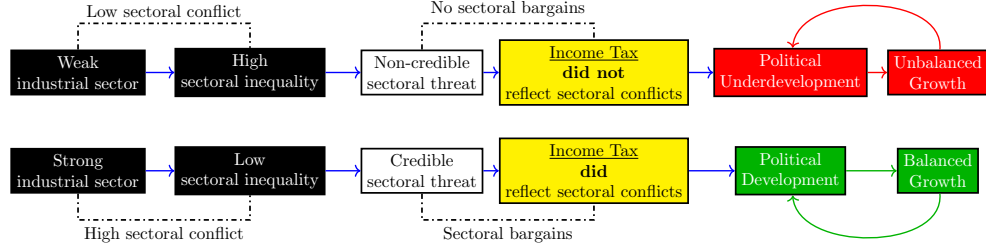
Figure 3.1: Causal Mechanism

An elite divided on an *economic* cleavage should at the same time be divided on their *political* preferences, particularly regarding their attitudes towards taxation.[4] Taxation affects landowners and industrialists in different ways.[5] Agriculturalists will systematically resist it as land fixity increases the risk premium of their main asset.[6] In contrast, industrialists' preferences toward taxation are more elastic as capital can be reinvested in nontaxable sectors.[7] However, class conflicts are more likely to resolve in favor of direct taxation when income inequality *among the elite* is low.[8] When inequality among the elite is high, there are no incentives to cooperate, and rather the leading elite rules in a monopolistic way. However, given that similar degrees of sectoral economic development can be converted into armies of similar capabilities,[9] elites will have incentives to make agreements rather than engaging in conflict when their economic/military capacities are similar. When levels of inter-elite inequality are low, war is more likely to exhaust all existent assets without producing positive outcomes for either sector,[10] generating then pressures to reach agreements instead of engaging in armed conflicts.

I argue that the emergence of the industrial sector lowered the levels of inter-sectoral inequality making possible higher levels of inter-sectoral contestation, forcing industrial

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[4]See for example Llavador and Oxoby [2005].

[5]Acemoglu and Robinson [2009, 289].

[6]Robinson [2006, 512].

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

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

[9]Boix [2015]. For example, elites could use a faction of the existing army or hire private militias.

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

and agricultural political elites to make institutional agreements, causing in turn long-term economic growth. I identify one such compromise, the implementation of the income tax. Elsewhere I have argued that the rise of the industrial sector accelerated the implementation of the income tax law,[11] causing a long-lasting positive impact on state institutions and political development.[12] In this paper I study how the implementation of the income tax in the presence of high sectoral conflicts set states in a path of political development causing long-term *modern* (i.e. 'balanced') economic growth (see Figure 3.1). While balanced growth (end of causal chain) implies the expansion of the industrial sector (beginning of causal chain), the expansion of the industrial sector does not imply balanced growth. Balanced growth implies a much deeper long-run relationship of sectoral inter-dependence. However, mere industrial expansion could be short-lived. Although Bahamonde [2017b] studies the *timing* of the implementation of the income tax as a function of the emergence of the industrial sector, here I present an argument centered on the *long-lasting consequences on economic growth* of the implementation an income tax (when it responded to sectoral conflicts/bargains). Since the economy alters the balance of political power, this theory is relevant for explaining political development too (circular arrows at the end of the causal chain). The political significance of balanced growth is that when both sectors expand in a balanced fashion (which does not necessarily mean similar growth rates), it *reinforces* the need to sustain levels of political cooperation (backward arrows in Figure 3.1). The crux of the argument is that the economic structural transformation characterized by "a secular decline of agriculture and substantial expansion of manufacturing"[13] imposed tight constraints on the way politics was run by the incumbent landowning class. In that sense, this paper considers that given that each economic sector has a corresponding political arm, the *sectoral* conflict is also a *political* conflict.[14] Consequently, these gradual long-term changes not only altered the structure of the economy but also the institutional order.

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[11]Bahamonde [2017b].

[12]Bahamonde [2017c].

[13]Johnston and Mellor [1961, 567].

[14]See Ansell and Samuels [2014] and Bahamonde [2017b].

Adopting the fiscal sociology paradigm, I contend that tax institutions as conflictual devices *made* the state, improving not only bureaucratic development but also expanding the *dominion* of the state, fostering in turn institutional development. Analytically, this theory speaks to a broader conceptualization of the role of inter-elite (in)equality on political and economic (under)development. I find that in cases where the income tax was introduced in reaction to the early emergence of a strong industrial sector, the implementation of this institution reversed the institutional order that had permitted an economic backwardness equilibrium inherited since colonial times. In these circumstances, the implementation of the income tax law was product of a sectoral compromise between two equally powerful elites, allowing the inclusion of both groups in the state-making projects. My analyses suggest that before the income tax law, when the landowning elites ruled in a monopolistic way, institutions were designed to give unfair economic advantages to the agricultural sector. However, in contested scenarios, the implementation of the tax was associated with the reversal of the old institutional order, causing long-term economic growth. In contrast, when the elite structure and levels of sectoral conflict were weak, the income tax did not reflect the sectoral conflict but other forces. For instance, the implementation of the income tax law in Chile happened very early, in 1924, just at the time when there were lower levels of inter-sectoral inequality, securing the inclusion of both groups in the implementation of a series of investments in state institutions. In fact, the Chilean revenue service is among the finest tax institutions in Latin America. However, Guatemala imposed the income tax law very late, in 1963, and by 1967 the national income tax office employed 194 people, and only 9 of whom had graduated from college.[15] While Guatemala implemented the tax, the institution did not reflect the preferences of both sectors. In fact, the law responded more 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.

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[15]Di John [2006, 5].

In these kinds of scenarios, landowners were never challenged and there were less pressures to centralize the state, making further institutional investments less likely. Hence, even though in these cases the income tax was implemented, the tax did not reflect the *early foundational sectoral cleavage*, compromising long-run economic development by crystallizing the old institutional order inherited since colonial times. Consequently, the income tax is a necessary but not sufficient cause of development as it requires the presence of high sectoral conflicts to cause economic development.[16]

Next section explains the dual sector model, explaining how balanced growth happens, why it does not mean 'equal' growth, why it does not imply the absolute decline of the agricultural sector, and why it is important for political development. Then I provide some historical context using the Chilean case to illustrate the theory. Using the fiscal sociology paradigm, I try to pay especial attention to how the series of inter-elite bargains that surrounded the implementation of the income tax fostered institutional development and state-*making*. Next, I present some econometric evidence, putting especial attention to the relationship between institutional development, particularly, fiscal expansion and long-term balanced growth. Lastly, I provide some final comments.

3.2 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]

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[16]Similarly, Johnson and Koyama [2017] find that the link between state capacities and economic growth is conditional on several factors (population size, culture, population homo(hetero)geneity, among others). However, in my account, the role of the income tax is conditioned on the degree of intersectoral conflicts, which I measure via the size of the industrial sector.

The *dual sector* or *balanced growth* model explains the mechanics of economic modern growth[17] by emphasizing the importance of macro-structural gradual transformations. The model argues that the economic system is divided into two sectors loosely defined as 'advanced or modern sector' or 'manufacturing sector,' and as 'backward or traditional sector,' or 'agriculture.'[18] 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 goes from a low-productivity sector to high-productivity, eventually surpassing the agricultural sector. If the agricultural sector lacks economic efficiency, the industrial sector will hardly develop, leaving the country in an economic trap. This literature is vast. While in this section I explain the core of it, there are many current theoretical and methodological applications as well as extensions of the dual sector model. Just to name a few examples, 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. This paper links decreasing levels of inter-elite inequality with balance growth and inter-elite political contestation.

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."[19] And while dichotomizing the entire economy in just two sectors might sound as too much of an oversimplification,[20] I follow Dixit [1973, 325] in that the dual

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[17]Gollin et al. [2002, 160].

[18]Jorgenson [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.

[19]Kelley et al. [1972, 8].

[20]This is a stylized theory. Of course, in reality, there are other economic activities such as logging, mining and others. Given its dependence on capital, mining has always been considered industrial. The Chilean case illustrates this.

economy model provides a significantly better description of the economy because "it reflects several vital social *and* economic distinctions."[21] 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."[22] 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.[23]

Economic development depends on the emergence of the industrial sector which in turn depends on the development of a productive agricultural sector.[24] As Kuznets [1961, 59] puts it, "economic growth is *impossible* unless there is a substantial rise in product per worker in the agricultural sector."[25] Following Jorgenson [1961, 311], Ranis and Fei [1964, 59], Jorgenson [1967, 291], Skott and Larudee [1998, 279-280] and Vollrath [2009, 290], the industrial sector is assumed to use capital and labor (having both increasing returns to scale). And while the agriculture sector also needs capital,[26] I follow conventional wisdom in development economics and assume that agriculture uses land (which is fixed) as the main input, and labor. This implies that the industrial sector is *structurally* advantaged: the fixity of land requires countries to industrialize in order to grow, and for that they need first an efficient agricultural sector. This insight is shared by many other development economists. Hayami and Yamada [1969, 105]

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[21]Emphasis is mine.

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

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

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

[25]Emphasis is mine.

[26]Federico [2008, 40].

for example argue that "[i]ndustrialization and modern economic growth are basically *conditioned* by the level of agricultural productivity."[27] 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." This structural transformation is the key of economic growth. If the expansion of the agricultural sector is compromised, it will necessarily compromise the expansion of the industrial sector as well.[28] The political correlate is that a weak inter-sectoral economic cleavage engenders a weak *political* elite structure. Since agriculturalists were an economic hegemonic group protected by norms and institutions that originated in colonial times, slow industrial sectors left agricultural political elites uncontested,[29] compromising both political, and economic development - as I explain here. Thus, this argument speaks to a broader theory of general 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.

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."[30] Technologies such as "crop rotation, pest control, seed breeding [and] fertilizer use [represent]

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[27]Emphasis is mine.

[28]In 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."

[29]Bahamonde [2017c].

[30]Kelley et al. [1972, 133].

the major potential source of agricultural labor productivity,"[31] increasing also "non-agricultural value added per worker."[32] 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.[33]

Surplus of labor naturally leads to a reallocation of redundant workers into the industrial sector, which is the crux of economic development.[34] Nurkse [1953] in fact argues that development *means* to employ the surplus labor.[35] The literature coincides in that the 'natural role' of the agricultural sector is to provide labor to the industrial sector.[36] 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 the industrial labour force."[37] 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 means *redundant labor force*.[38] In fact, Nurske [1961, 225] points out that the concept

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[31]Ranis and Fei [1964, 62].

[32]McArthur and McCord [2017].

[33]Johnston 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 mayor source of employment.

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

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

[36]Ranis 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.

[37]Emphasis is mine.

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

"is commonly used to denote all types of rural unemployment."[39]

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.[40] "It is *self-evident* that without increasing food output, the capitalist sector must remain in a stationary state."[41] 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."

Finally, it is important to say that "the agricultural sector declines relative to the overall economy but continues to expand absolutely."[42] In other words, it is the "the proportional contribution of agriculture to the growth"[43] that decays, implying that in the long run the agricultural sector "must also grow,"[44] especially given the continuing dependence on a constant supply of food.[45] Consequently, balanced growth does not imply 'equal' growth, but rather a long-run inter-sectoral dependence.

3.3   Dualism in Chile, a brief illustrative case

Historically, agriculturalists had been a hegemonic group protected by norms and institutions that originated in colonial times. Those norms had survived due to institutional inertia, perpetuating their advantaged position.[46] As Collier and Collier [2002, 106]

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[39]Or 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.

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

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

[42]Nerlove [1994, 14].

[43]Kuznets [1961, 45].

[44]Ranis and Fei [1961, 534].

[45]Nicholls [1963, 2].

[46]This idea also applies for Mexico. "The principal source of its wealth was not its mines, Humboldt noted, but agriculture." Amaral and Doringo, in Uribe-Uran [2001, 13].

argue, the "national government was dominated by [...] owners of large agricultural holdings,"[47], in turn 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." Similarly, 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.[48]

While on the one hand institutions, policies and other practices were biased against industrial elites, on the other, rapid industrial growth (see Figure 3.2, top left) incentivized industrial elites to form pressure groups to offset the bias against them. The little public infrastructure that existed benefited the agricultural sector only. 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." To address this situation, industrialists started to "form trade associations to engage in lobbying and propaganda."[49] Eventually, these interests groups turned into political parties.[50] These new groups, backed by their economic leverage, put pressures to open the political system in a way that allowed industrial elites to gain egalitarian political conditions and equal access to state power. While initially both elites confronted each other in two civil wars,[51] conflict was not sustainable over time. Consequently, Chilean agricultural and industrial elites opted for a political compromise. The keystone of these inter-elite compromises was the implementation of the income tax in 1924, which marked the beginning of an institutionalization path. As others have observed, industrialists "accepted taxation, *while demanding state services and expecting to influence how tax*

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[47]See 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."

[48]Bauer [2008, 45].

[49]Weaver [1980, 107].

[50]Collier and Collier [2002, 109].

[51]Zeitlin [1984, 23] argues that the civil wars challenged a "large landed property [elite against a] productive capital [elite]."

revenues were spent."[52] This is why the expansion of political rights *among the elite* and the rise of the industrial sector shared the same timing. As Collier [1977, 683] has pointed out, "the real story of Chilean industrialization belongs to the Parliamentary period" (1891-1925).

The implementation of the income tax in Chile, as part of the sectoral bargain, was then associated with the implementation of other state institutions and services, expanding in this way the bureaucratic *dominion* of the state. However, unlike other 'regular' state institutions, taxing incomes *made* the state.[53] It is the very practice of this technology that gives the state the big push making it able to continue the reproduction of its power. Critically, from the elite's perspective, it was in their interest to see these extractive capacities grow. Taxation is more likely to survive as an institution when it counts with the elite's 'blessing.' Boix [1999] and Parente and Prescott [1994] explain how the development of certain institutions or the adoption of certain technologies are implemented when they go in the benefit of the elites. In turn, Kurtz [2013, 86] points out that state expansion "must be reasonably understood as nonthreatening to the fundamental material interests of nearly all politically relevant fragments of the upper class." In fact, for the Latin American case, Beramendi et al. [2016] argue that "capitalist elites [*preferred*] to shoulder a higher tax burden through progressive direct taxation, which they [viewed] as the least-worst economic option."[54] Fiscal sociologists argue that the capacity the state has of taxing its subjects *diffuses* to other state institutions via spillovers. For example Musgrave [1992, 99] argues that since taxation (especially of incomes) requires such a high degree of state penetration, *public finances*

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[52]Carmenza Gallo, in Brautigam et al. [2008, 165]. Emphases are mine. She refers specifically to nitrate producers, one of the first industrial activities.

[53]Indirect taxes are easier to levy (Krasner [1985, 46], Bertola and Ocampo [2012, 132]), and hence this kind of revenue is generally considered "unearned income" (Moore [2004b, 304]) or "easy-to-collect source of revenues" (Coatsworth and Williamson [2002, 10]). Given the relatively lower costs states have to incur to collect them, indirect taxes have a very low impact on state-building (Moore [2004a, 14]). In fact, when early Latin American states depended heavily on trade taxes, the state apparatus tended to be less developed (Campbell [1993, 177]).

[54]They particularly argue that progressive taxation is better relative to "trade taxation, which can negatively impact the industrial sector" (p. 18). Similarly, Best [1976, 71] argues that the "taxes can be viewed as dependent upon the distribution of power rather than as an expression of the free choice of the majority of the people."

offer the key for a theory of state-making. Finally, Bahamonde [2017c] finds that the implementation of the income tax was associated with institutional development and state expansion. Here I contend that the implementation of such institutional order fostered economic growth, leveling the economic and political power of both elites in the long-run. Under balanced growth, the political consequence is that both sectors need one another to grow, limiting the excessive power of one political elite over the second political elite. And while agricultural growth declines overtime, it continues to expand absolutely, preserving the political balance between the two elites.

3.4 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]

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

The emergence of a new industrial sector created a new politically disenfranchised elite who demanded political and economic reforms, ending years of political asymmetries. The keystone of these inter-elite compromises was the implementation of the income tax, setting countries in a path of both political and long-run economic development. The income tax, as an institution that contributed to develop further institutional

development, should then be associated with long-term economic growth, and consequently with a secular relative decline of agriculture and substantial relative expansion of manufacturing. To test this hypothesis, the theory should pass a number of tests. As argued, *before* the inter-sectoral compromises (i.e., before the income tax law was implemented), political institutions and social norms inherited from the colonial period were designed to allocate economic inputs in a way that benefited the landowning class. Hence, I expect the transference of economic inputs to go *from* the industrial sector *to* the agriculture sector, an *economic backwardness equilibrium* as stated by the dual sector model. In other words, I expect the agricultural sector to grow *at expenses* of the industrial sector. However, *after* the income tax was implemented, we should see a *reversal* of the flow of inputs, generating growth *from* the agricultural sector *to* the industrial sector (balanced growth). In this case, I expect the industrial sector not to grow at expenses of agricultural development, but *because of* agricultural development. As stated before, industrial growth *depends* on agricultural growth. In econometric terms, we should see that the income tax reversed the way in which one sector 'Granger-caused' the other.[55] Lutkepohl [2006, 42] explains that if some variable X forecasts variable Y (and not vise 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."[56]

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[55]This is not an experimental design, and hence the term 'causation' should be taken loosely. Both Beck [1992, 241] and Angrist and Pischke [2008, 237] Granger-causality is not really *causal*.

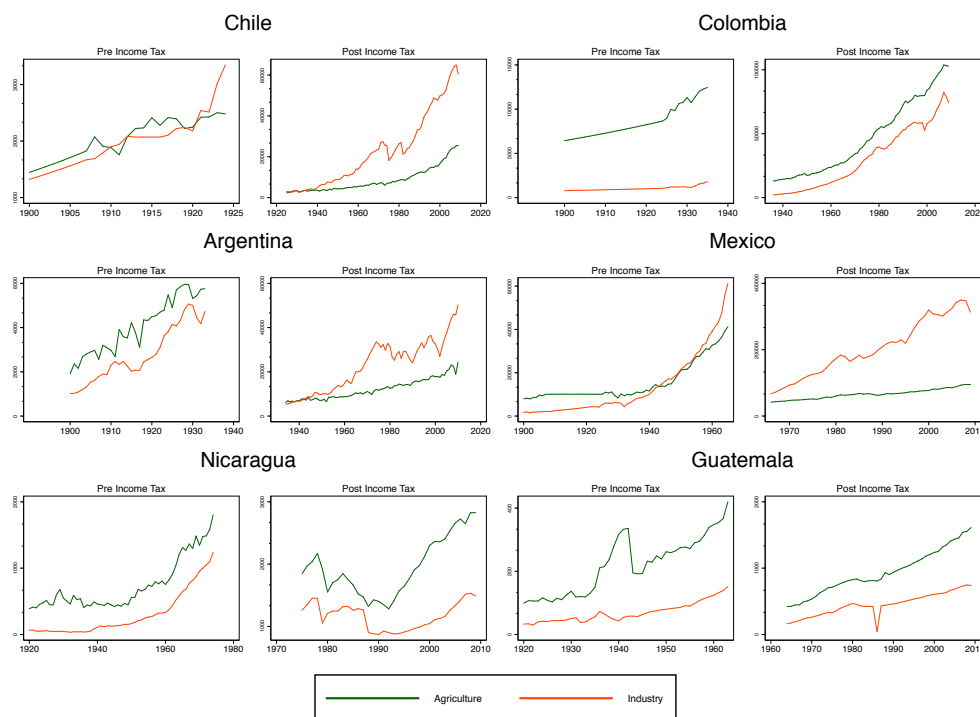[56]See Durr [1992, 197] for a similar definition.

Figure 3.2: Sectoral Outputs Before and After the Implementation of the Income Tax Law

I utilize the MOxLAD data to test this, particularly the *agriculture value-added* and *manufacturing value-added* variables.[57] The dataset spans from as early as 1900 to as late as 2009.[58] Table 6.1 specifies the available time-spans. Using secondary information, the table also states *when* the income tax was implemented, what the law was and its corresponding source(s).[59] Following Mahoney [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 3.2 shows the sectoral outputs for each country, both before and after the income tax law was implemented.

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[57]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."

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

[59]Some countries implemented some kind of income tax before, however these laws lacked enforcement, they were weak or not at all followed. In Table 6.1 in the Appendix section I establish the year that the literature seems to agree for when the law was implemented and properly enforced.

In Table 3.1 I test for Granger-causality, i.e. the direction in which economic growth was produced both prior and after the implementation of the income tax law.[60] The results strongly suggest that the income tax caused a structural transformation in (almost) all 'developed' countries, namely Chile, Colombia and Mexico. In all these cases the income tax reversed the initial inter-sectoral growth equilibrium suggesting a contested elite structure, as the case of Chile conveys. Before the income tax law, industrial development Granger-caused agricultural development, and after the income tax law, the agricultural sector Granger-caused industrial development (all p-values are significant at the .05 level).[61] The data analyses suggest that the implementation of the income tax was associated with a reversal of the 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. 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 3.1).[62] In Nicaragua and Guatemala the tests suggest the exact opposite (all p-values are significant at the .05 level).[63] The implementation of the income tax in these countries did *not* reverse the initial economic backwardness equilibrium because when lately implemented, the tax did not reflect the inter-sectoral tensions, challenges and compromises proper of the contested political economies. The industrial sector never had enough economic leverage to politically confront the landowning elite (see Figure 3.2) and hence industrialists never posed credible threats to the status quo, relaxing the endogenous incentives to invest in state institutions. The Argentinian case is different. The Granger tests are inconclusive, and no significant results were found, suggesting a weak inter-sectoral cleavage structure.

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[60]Specifically, the tests were computed after estimating the reduced form VAR specified in Equation 3.1.

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

[62]See especially next section.

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

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 - 1965	Agriculture → Industry	.73	0.39
			Industry → Agriculture	11.57	0.00
	Post	1969 - 2009	Agriculture → Industry	5.56	0.06
			Industry → Agriculture	1.32	0.52
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 3.1: Granger Causality Wald Tests

Vector Autoregressive Models (VAR) and Impulse Response Analysis (IRF)

Once we have determined the directionality of economic growth is associated with the imposition of the income tax law, it is necessary to establish the inter-sectoral long-run economic equilibrium. This section then tests whether a change in political institutions (particularly, the implementation of the income tax) is associated with long-run economic development. This relationship is endogenous.[64] If this endogeneity 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. 'Unit root' or 'integrated' *I(1)* vectors[65] are time-series that "wander" up and down, yet they never reverse to a given mean.[66] Simply put, integrated series are processes whose deviations from the mean tend to persist, cumulating or growing in time. In other words, these are series whose innovations do not dissipate, but persist in time. And such, analysts usually study economic growth using this methodological framework. Moreover, two integrated vectors that are mutually endogenous (like industrial and agricultural growth) imply a 'cointegrated' CI(1) relationship, imposing additional statistical restrictions.[67] A "set of integrated time-series is said to be cointegrated if some linear combination of the series in levels produces a stationary series," or *I(0)*.[68] The economic literature generally coincides in that economic growth is an I(1) process, and that sectoral development is a CI(1) process.

Integration and cointegration are assumptions that should be tested. The first step is to find strong evidence of integration in each of the series. In Table 6.2 I show several unit root tests.[69] The table indicates that all variables, periods, sectors and countries

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[64]Tiffin and Dawson [2003, 33].

[65]The order of integration could be higher than 1. However, for simplicity sake, I restrict my analyses to I(1) processes, which is the most common strategy in applied econometric analyses of time series.

[66]Box-Steffensmeier et al. [2014, 129].

[67]See Granger [1981] and Engle and Granger [1987]).

[68]Durr [1992, 193].

[69]I 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.

have I(1) processes. The second step is to find evidence of cointegration.[70] 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 of cointegration implies coordination failures between the two sectors (economic backwardness), the delayed emergence of a political challenger, the lack of an economic/political sectoral-based conflict, and consequently a politically unchallenged landed elite. Given that the maximum number of cointegrated vectors in bivariate cointegrated series is 1, I only test for the minimum number of cointegrated relationships.[71] I expect to find evidence of cointegration only in the 'developed' cases. Following Johansen [1988], Table 3.2 indicates that all 'developed' and 'semi-developed' countries have cointegrated series, while 'less developed' countries do not have cointegrated series.[72]

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 3.2: Johansen Tests for Cointegration: Complete Series

To estimate the long-run inter-sectoral economic growth relationship of cointegrated vector, it is necessary "a particular kind of model."[73] If traditional methods are used,

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[70]I 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.

[71]Box-Steffensmeier et al. [2014, 165].

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

[73]Wooldridge [2002, 571]. Cointegrated vectors, ECM and VAR models are widely common in political science too. Just to mention some examples, refer to Ostrom and Smith [1992], Krause [1997], Fish and Choudhry [2007], Haber and Menaldo [2011], Sobel and Coyne [2011], Herzer and Vollmer [2012, 489] and Blaydes and Kayser [2011].

given the interdependent relationship of these kinds of time-series, the results will be spurious.[74] I use the vector-autoregressive approach (VAR) specified in Johansen [1988] which among several advantages, is estimated via MLE. Another advantage is that VAR models do not need to specify the number of cointegrated vectors as opposed to error correction models.[75] Formally, I will model the next reduced form VAR in differences, one per country, both before and after the income tax law was passed:

$$
\begin{aligned}
\triangle M_{t_m} &= \alpha_m + \beta_m \triangle M_{t-l} + \beta_m \triangle A_{t-l} + \epsilon_{t_m} \\
\triangle A_{t_a} &= \alpha_a + \beta_a \triangle M_{t-l} + \beta_a \triangle A_{t-l} + \epsilon_{t_a}
\end{aligned}
\tag{3.1}
$$

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 3.1 is in standard form. Table 6.3 describes the optimal lag structure per each country regression.[76] Most tests give satisfactory results.

Given that "it is often difficult to draw any conclusions from the large number of coefficient estimates in a VAR system,"[77] econometricians usually turn to the analyses of *impulse response functions* (IRFs), which are derived from VAR analyses.[78] "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."[79] Figure 3.3 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

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[74]Ostrom and Smith [1992, 142-143].

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

[76]The next information criteria were used to determine the appropriate lag length: final prediction error, AIC, 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 3.2. 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.

[77]Lütkepohl and Krätzig [2004, 159].

[78]The raw VAR regression tables are available upon requests.

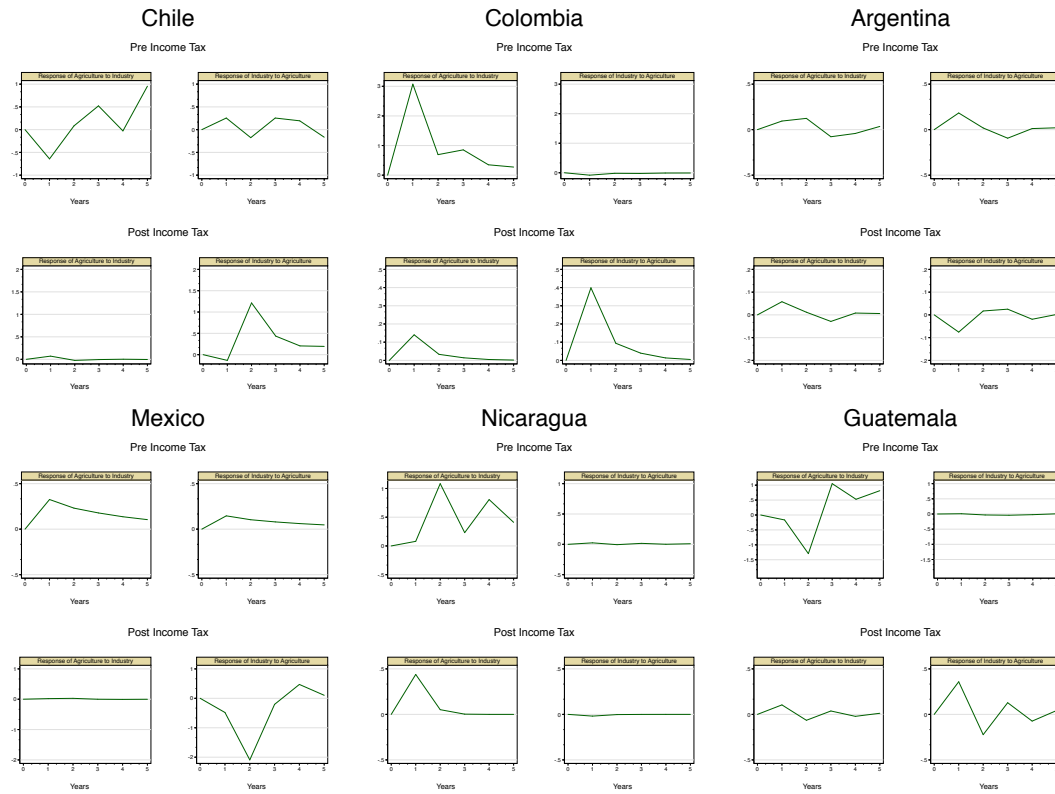[79]Stock and Watson [2001, 106]. See also Lütkepohl [2005, 51].

Figure 3.3: VAR Impulse Response Functions: Sectoral Responses to Each Other's Growths

income tax. 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 economic growth after having implemented the income tax indicates that this institution did not alter colonial backwards economic and political institutions. 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.[80]

Figure 3.3 suggests that all 'developed' countries switched from an economic backwardness equilibrium to a modern economic growth strategy after the income tax was implemented, indicating a change in the institutional order. For example, a shock to industrial growth in Chile before the tax has 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 the political institutions before the tax were oriented to channel all economic resources in a way that advantaged the agricultural sector and the landed elites. This situation was reversed after the income tax law causing long-term balanced economic growth. Colombia and Mexico show a similar pattern. While the analyses on the Argentinean case suggest that there is a long-term inter-sectoral relationship (Table 3.2), according to Figure 3.3 and Table 3.1 this relationship is weak, indicating weak inter-sectoral complementarity. Nicaragua and Guatemala are the prototypical backward cases. In each case, the economy was designed to develop the agricultural sector completely at the expenses of the industrial sector. This goes in line with the null findings of cointegration in Table 3.2 and Granger-causality tests in Table 3.1. 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. The political correlate is the lack of a strong political challenger. Figure 3.2 suggests that the industrial sector was always weak, indicating that their corresponding political elites were unable to contest the landowning class. In both cases the implementation of the income tax did not reverse the initial economic backwardness equilibrium because when implemented,

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[80]That 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]).

it did not reflect the inter-sectoral cleavage (because there was no cleavage). The lack of sectoral challenges and compromises left the traditional institutional order unaltered, preserving the political advantages the landowning elites enjoyed since colonial times.

3.5   Discussion

Historically, agriculturalists were a hegemonic group protected by norms and institutions since colonial times. 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.

I theorized that when the income tax was implemented under politically contested circumstances, this institution expanded the overall state capacities, crystallizing a series of reforms that replaced the old institutional order inherited since colonial times, fostering long-term balanced/modern economic growth. In turn, balanced growth reinforced sectoral inter-dependence, precluding sectoral dominance of either political elite. Such 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. Particularly, industrial elites were being excluded from politics, and they accepted to be income taxed in exchange of being allowed to participate in politics under fairer conditions. These series of inter-elite bargains helped the state to expand its dominion by offering different and new state services, improving the bureaucracy, and critically, bonding conflicting elites in an path of mutual institutional compliance.

My statistical analyses suggest that when the sectoral cleavage was high the implementation of the income tax fostered balanced growth. That is, when there was evidence in favor of integration and cointegration, conditions were more favorable to generate balanced growth. I explain that balanced growth secured egalitarian political

conditions between the two elites. The main findings are that the post income tax institutional order fostered long-run balanced economic development, keeping both elites politically accountable to one another. I find that in both *strong* and *weak* cases, the pre income tax institutional order was designed to give unfair economic advantages to the agricultural sector. However, when the industrial elites were able to challenge the landowning class, the new institutional order in which the income tax was situated reversed that. I established these relationships using Granger-causality tests. When sectoral contestation was high, political contestation was high, and the income tax (as a state-making institution) put countries in a path of long-run balanced economic growth.

Chapter 4

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

Students of the Latin American states have several theories to explain the causes and consequences of state capacities. Scholars also have countless alternatives to measure state capacities. However, there exists a huge deficit. Most state formation theories (just to name a few) are situated during precolonial,[1] early[2] or late[3] independent Latin America. Yet, we lack of a measurement that corresponds *temporally* with the theories we have. While our explanations of state-making are *historical* in nature, in practice, most available measurements capture *contemporary* levels of stateness. In this paper I try to bridge this gap by providing an explanation on the origins of state capacities in Latin America and a corresponding indicator able to capture levels of state capacities *over time*. This paper then seeks to contribute to the state formation literature in general, both from a theoretical and methodological perspectives.

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[1]Mahoney [2010].

[2]See Kurtz [2013] and Soifer [2015].
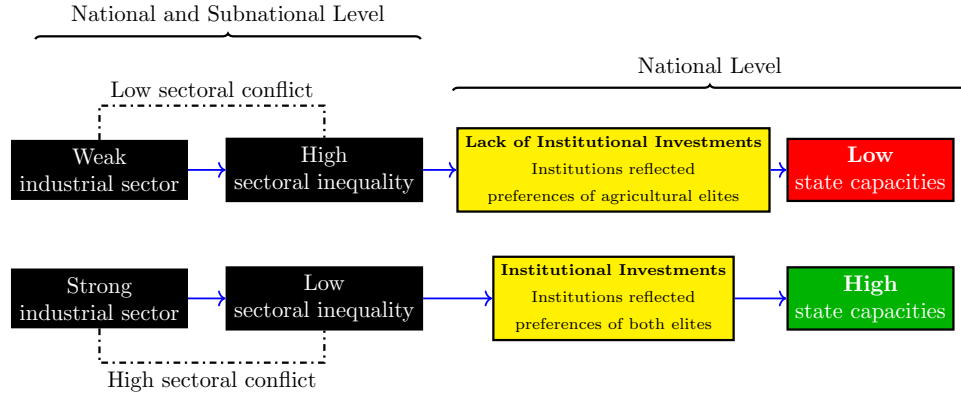
[3]Bahamonde [2017b].

Figure 4.1: Causal Mechanism

I argue that higher levels of sectoral contestation, both nationally and subnationally conceptualized, increased state-capacities over time. Specifically, I explain how the emergence of industrial elites lowered levels of inter-sectoral inequality, pushing both agricultural and industrial elites to reach agreements that materialized in investments in state-*making* institutions, causing in turn higher state-capacities (Figure 4.1). Exploiting the exogeneity of earthquake shocks, I leverage a novel dataset on Chilean earthquake death tolls overtime and a Bayesian multilevel Poisson model with year fixed-effects to account for state capacities between 1900 and 2010. I contend that the capacity the state has of enforcing and monitoring building codes throughout the territory is a *reflection* of Chile's *overall* state capacities. Earthquakes happen at any level of development and are orthogonal to differences in regime type. Consequently, death-toll differentials should be associated with state-capacities only. However, the ability the central level has of enforcing these (and other) institutions depends on whether subnational elites are willing to cooperate with the central level, implementing these norms. In other words, state-*making* requires the political incorporation of subnational entities into the respective national projects. The argument explains that higher levels of sectoral threats led both political elites to make institutional compromises. In this paper I identify one such compromise, the implementation of the national income tax law. Sectoral threats were more credible when the relevant elite at the local level was *not* the same that lead the national economy, signaling a generalized situation of

sectoral indeterminacy, where neither the industrial nor the agricultural sectors were the dominant elites. For instance there were higher levels of contestation when there were sustained levels of *national* agricultural growth in the presence of consolidated industrial clusters at the *subnational* level. In turn, the income tax law was a state-*making* institution. Similarly, while the income tax law was implemented nationally, compliance depended on subnational cooperation too. As I detail later, lower levels of sectoral inequality fostered the incorporation of industrial elites into the national project, and hence they were willing to pay the national income tax in exchange of public goods delivered at the subnational level. Finally, what my empirical analyses show is twofold. Death-tolls decreased, that is, *state capacities increased*, when (1) levels of national/subnational sectoral contestation increased overtime, and (2) after the income tax law was implemented. This last finding in particular finds support for the fiscal sociology paradigm, and particularly, for the idea that direct taxation has positive externalities on state-*capacities*, making this institution a state-*making* institution.

The crux of the argument is that sectoral conflicts *triggered* state development. Elites whose assets are allocated in different sectors of the economy have different preferences over state centralization and direct taxation. Consequently, economic expansion of these two economic sectors not only shaped the economic landscape; given that each sector had a corresponding political arm, the *political* conflict is rooted into a broader *economic conflict* conflict too.[4] I sketch a theory where state-penetration and institutional enforcement are higher when the mayor economic sectors of the economy are incorporated into the same state-building national project. Elite incorporation is possible contingent on the capacity the new elites have of overthrowing 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 in colonial times. While the agricultural sector dominated most of the economy, the landowning class controlled most of the politics.[5] However, when the

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[4]See Ansell and Samuels [2014].

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

structural transformation (that is, the "secular decline of agriculture and substantial expansion of manufacturing")[6] took place, this process imposed tight constraints on the way politics was run by the incumbent landowning class.[7] Thus, given the initial advantage of the landed elites, the secular emergence of the industrial sector also meant the reduction of inter-sectoral inequality, generating political, economic and military threats to the landed elites.[8] The higher the threats, the more likely the inter-sectoral compromises.

I contend that lower levels of inter-sectoral inequality made possible higher levels of inter-sectoral contestation giving way to a series of inter-elite compromises (yellow box in Figure 4.1) that fostered higher levels of state-capacities overtime. In this paper I identify one such compromise, the implementation of the income tax, and how this crucial institution for state-*making* included the preferences of both elites. Leveraging historical evidence, I explain that Chilean industrial elites accepted to be income taxed while demanding more state services and in exchange of being allowed to participate in politics under fairer conditions. In turn, I show statistical evidence that suggests that the implementation of the income tax law had positive externalities for state-building over time. Bahamonde [2017b] finds that the emergence of a strong industrial sector *accelerated* the implementation of the income tax law in a number of Latin American countries. While he theoretically *relies* on the fiscal sociology paradigm to argue about these positive externalities of direct taxation on state-building, here I present empirical cross-time evidence supporting his claims. Additionally, I introduce a new strategy to measure levels of state capacity over time.

Critically, I claim that the capacity the state has 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, where there were *in the same country* 'brown areas,' or heterogeneous areas that mixed both 'high' and 'low' levels of stateness. This approach goes in

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[6]Johnston and Mellor [1961, 567].

[7]Bahamonde [2017b].

[8]Boix [2015]. For example, elites could use a faction of the existing army or hire private militias.

line with Snyder [2001, 103] who explains that subnational comparisons are useful to compare political and economic processes that vary spatially, and with Ziblatt [2008, 286], who points out that 'any account, which attempts to explain local public goods provision *without* reference to the capabilities of local government, might be incomplete.' Following these distinctions (and Soifer [2008] in particular), I implement an identification strategy that not only accounts for temporal but also for geographical sources of sectoral contestation. While Bahamonde [2017b] and Bahamonde [2017a] conceptualize sectoral contestation only at the national level, here I argue that *national* agricultural expansion in the presence of important *subnational* clusters of industrial development fostered a generalized situation of sectoral indeterminacy, where no group was the leading elite. Thinking of sectoral contestation in subnational terms is useful for state-building. Higher levels of subnational sectoral contestation translated into more credible threats coming from the provinces and other distant parts of the territory. Should these subnational sources of contestation *not* be translated into sectoral agreements, the country risked being torn apart, or alternatively, see the emergence of local *caudillos* or other regional 'bosses.' For example, 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.'[9] Local bosses had to approve on 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. While my proposed measurement captures this subnational/national *dissonance*, the theory explains how contestation translates into cooperation and state incorporation. Particularly, industrial elites accepted to comply with the national income tax in exchange of public goods delivered at the local level, suggesting a process of sectoral incorporation into the national state-building project. Here I explain how the process of income taxation increased state-capacities over time.

The rest of the paper proceeds as follows. In section 4.1 I explain how the conflicting sectoral nature of the implementation of the income tax is linked to state capacities.

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[9]My translation.

Next, in section 4.2 I introduce and explain the proposed measurement, and how it maps with state capacities. Then, in section 4.3 I present some econometric evidence, and finally I offer some final comments in section 4.4. In **??** I show some Bayesian convergence diagnostics.

4.1 Fiscal Sociology, Sectoral Conflicts and Sate Consolidation

Political scientists have leveraged the sectoral conflict approach to explain mostly democratization. For example, Geddes [1991] explains that competition between two rival parties of about the same size creates clearer incentives to invest in political institutions. Similarly, Ansell and Samuels [2014] and Boix [2015] examine the role of inter-elite economic inequality/equality on democratization. Here I argue that a theory focused on sectoral conflicts offers also a theory of state consolidation. As others have explained, "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."[10] This approach is particularly relevant for the Latin American cases due to the sectoral conflicts that existed between the agricultural and industrial sectors.[11] Here I contend that there are two elements that propelled state consolidation, namely, (1) how elites invested in different assets had different preferences over state centralization and taxation, and (2) how lower levels of inter-sectoral inequality fostered investments in state-*making* institutions, especially direct taxation.

Since state centralization affects landowners and industrialists in different ways, both sectors have different preferences towards taxation and state centralization.[12] On the one hand, land fixity increases the risk premium of the landed elite's main asset,[13] so they systematically resist taxation. In turn, as capital can be reinvested in nontaxable sectors, industrialists' preferences toward taxation are more elastic. In other words,

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[10]Hechter and Brustein [1980, 1085].

[11]Bahamonde [2017b] and Bahamonde [2017a].

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

[13]Robinson [2006, 512].

industrialists have an 'exit' option[14] that landowners do not have. Should fiscal policy not respond to the industrial class' demands, they can leave the country and reinvest.[15] That said, these cross-sectoral differences are more likely to resolve in favor of direct taxation when income inequality among the elites is low.[16] Considering the initial institutional and economical advantages the agricultural sector enjoyed since colonial times in the Latin American cases, reducing inter-elite inequality meant the expansion of the industrial sector. When income inequality among the elites is high, there are no incentives to invest in state institutions, and rather elites rule in a monopolistic way. In other words, in non-contested contexts, the institutional order reflects the preferences of the landowning elites, keeping industrialists excluded from the state-building project. However, the emergence of a strong industrial class put pressures for centralization and investment in public goods. 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." Lower levels of inter-elite economic inequality meant also similar degrees of military capabilities.[17] Under these circumstances elites had incentives to make agreements rather than engaging in conflict when their economic/military capacities were similar. When levels of inter-elite inequality were low, war was more likely to exhaust all existent assets without producing positive outcomes for either sector,[18] putting then pressures to reach agreements instead of engaging in armed conflicts.

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[14]Hirschman [1970].

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

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

[17]Boix [2015].

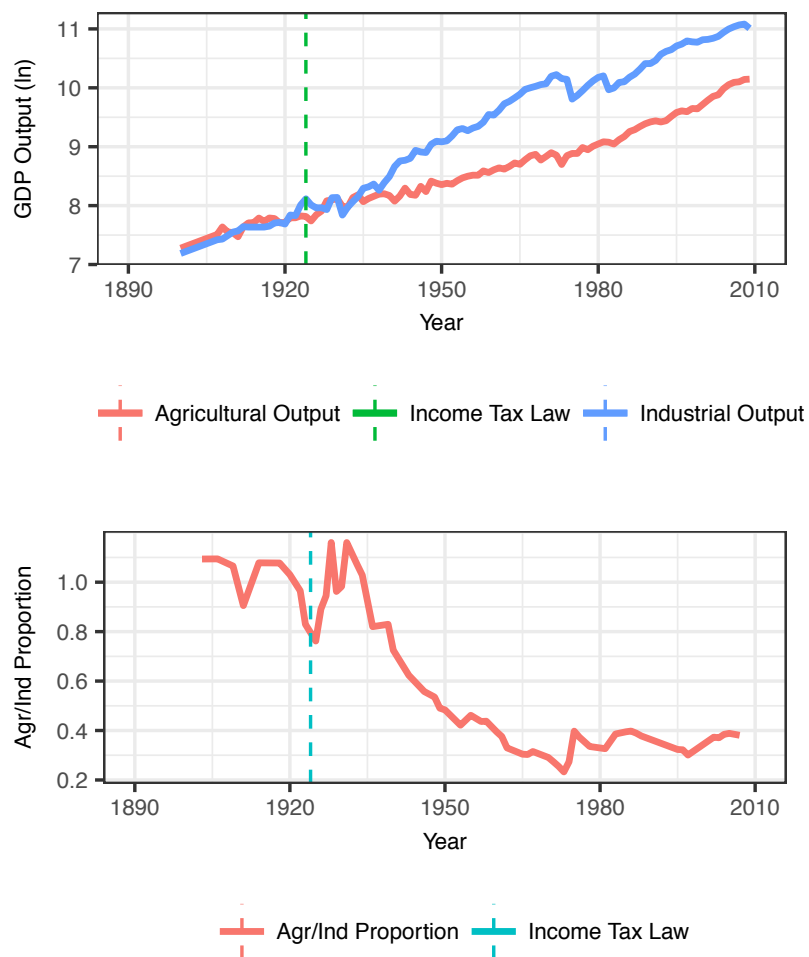[18]Richard Salvucci in Uribe-Uran [2001, 48].

Figure 4.2: Industrial and Agricultural Outputs, and The Passage of the Income Tax Law in Chile]Industrial and Agricultural Outputs, and The Passage of the Income Tax Law in Chile

In all Latin American economies during and right after the colonial period, agriculture was the most important sector.[19] And by extension, agricultural political elites were the most powerful elite.[20] For the Chilean case in particular, Collier and Collier [2002, 106] have argued that initially the "national government was dominated by the central part of the country, with owners of large agricultural holdings playing a

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[19]Keller [1931, 13].

[20]Wright [1975, 45-46].

predominant role."[21] There existed an important asymmetry, however. While both the agricultural and industrial sectors were growing at the same pace (see Figure 4.2, top panel), the latter were kept from participating in politics under fair conditions.[22] This asymmetry led these two 'antagonistic elites'[23] 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]." However, war was not sustainable over time. For instance, *Balmacedistas* managed to secure the support of the army, while *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,[24] suggesting an equilibrium where neither elite was the leading elite. Given their relative similar degrees of economic development and military capacities, the two elites opted for a political compromise. In 1924, industrial elites accepted to be income taxed by agriculturalist incumbents in exchange of having more *state services* and having a more open political system. Importantly, 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.*"[25] Critically, from the elite's perspective, it was in their interest to see these extractive capacities grow,[26] securing this inter-elite compromise for a longer period of time. For instance, Boix [1999] and Parente and Prescott [1994] explain how the development of certain institutions or the adoption of certain technologies are not only implemented by sustained overtime when they go in the benefit of the elites.

The tax was not important because of the new revenue it collected, however. While Humud (1969, p. 154) explains that the income tax generated considerable resources

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[21]Similarly, McBride [1936, 15] explains that "Chile's people live on the soil. Her life is agricultural to the core. *Her government has always been of farm owners. Her Congress is made up chiefly of rich landlords.* Social life is dominated by families whose proudest possession is the ancestral estate." Emphases are mine.

[22]Bahamonde [2017b].

[23]Keller [1931, 37-38].

[24]Collier and Collier [2002, 109].

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

[26]Beramendi et al. [2016].

for the Chilean treasury,[27] following the fiscal sociology paradigm, I contend that the tax was important for state-making because its implementation required a series of sectoral 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. Moreover, unlike other 'regular' state institutions and services, taxing incomes in fact infiltrated the state's coercive sovereignty unto the individual itself. The very implementation of the income tax produced a secular accumulation of know-how, particularly, of technologies able to monitor individual incomes. Observing individual economies and transforming private income into public property is what *causes* state consolidation.[28] In fact, Musgrave [1992, 99] argues that since taxation (especially of incomes) requires such a high degree of state penetration, public finances offer the key for a theory of state-building. Indirect taxes are, *ceteris paribus*, 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 did not require an elaborate fiscal structure.[33] Income taxation not only triggered other state capacities helping with the development of more skilled

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

[28]Musgrave [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.

[29]Moore [2004b, 304].

[30]Coatsworth and Williamson [2002, 10].

[31]Moore [2004a, 14].

[32]Campbell [1993, 177].

[33]Bertola and Ocampo [2012, 132].

bureaucracies. Via a process of assimilation, it also helped to construct 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 oblige them to pay, punishing whoever refuses to do so. From a sociological standpoint, this "generality makes taxation a crucial element in the development of the 'imagined community'[34] of the modern nation-state [...] Taxation enmeshes us in the web of generalized reciprocity that constitutes modern society."[35]

4.2   From Earthquake Death Tolls to State Capacities

More than being blessed, the literature is in fact cursed with the over abundance of poor indicators of state capacities.[36] 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] explains, its abundance "points to the poor state of empirical measures of the quality of states." The literature points out to two main concerns. First, 'most fragility indices barely satisfy scientific standards.'[37] And second, most indices are conflated with analytical and conceptual problems.[38] One notable example is protection of the rule of law which is commonly used to proxy state capacities.[39] 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 these 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'

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[34]Anderson [2006].

[35]Martin et al. (in Martin et al. [2009, 3]).

[36]Hanson 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.

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

[38]I 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].

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

and 'growth-inhibiting' by many businesspersons,"[40] introducing in this way systematic measurement error.[41] Likewise, expert surveys suffer from the same problem.[42] 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 to "explicitly avoid 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. did have a strong state, however it did *not* protect property rights. 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."[43] One of the dimensions is the absence of violence. However, "there isn't much byway of street crime or military coup attempts in North Korea,"[44] a state that can barely provide basic services to its population. Focusing on tax rates is not a solution either.[45] For example, in late imperial China, "the high taxes on peasants [...] were the result of rulers' lack of power. Chinese rulers consistently attempted to limit official's excessive extractions from the masses, but were unable to do so."[46]

This paper identifies a third limitation. Besides of their conceptual and analytical problems, most measurements provide a rough approximation of *contemporary* state capacities. 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)." Kurtz and Schrank [2012, 618-619] propose an experimental design based on list-experiments[47] to study (in an unbiased way) bureaucrat's opinions on whether "the bureaucracy was really

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

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

[42]Fukuyama [2013, 349].

[43]Kurtz and Schrank [2007, 543].

[44]Fukuyama [2013, 348].

[45]Yet, 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.

[46]Kiser and Tong [1992, 301].

[47]Refer to Aronow et al. [2014], Blair and Imai [2012], Blair et al. [2014], Corstange [2008, 2010], Glynn [2013], Imai [2011], Imai et al. [2015], Kane et al. [2004], Kiewiet de Jonge [2015].

based on a competitive, meritocratic process; whether tenure protections are effective; whether extralegal payments or extortion take place," among others. Finally, Soifer and Luna [2016] employ a survey-based design to measure subnational state capacities. While these measurements overcome the problems mentioned above, they do not help us to study state capacities in a historical setup. Economic historians and students of political development have offered other measures that seek (or could potentially be used) to capture levels of state capacities overtime, such as investments in public goods like infrastructure, roads,[48] electrification (measured as light intensity per pixel),[49] and railroads.[50] However, many of these measurement are debatable. For example, Soifer [2012, 593] explains that "railroads were often constructed by private actors."[51] The same problem applies to other types of infrastructures. The are others more appropriated strategies such as the opening of postal offices,[52] the administration of national censuses[53] and vaccination.[54] While these measurements advance our knowledge on levels of state capacities *overtime*, there are still other problems. 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 to 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 do, inflating the *average* level of state-capacity.

To solve some of these limitations, I propose earthquake death tolls as an alternative

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[48]See for example Mann [1984, 2008], Acemoglu [2005], Saylor [2012], Thies [2009], Besley and Persson [2010].

[49]Huntington and Wibbels [2014].

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

[51]Footnote #11.

[52]See for example Acemoglu et al. [2016].

[53]See for example Soifer [2013] and Centeno [2002]. This technique is borrowed from demographers, and it compares the age structure (incorrectly) captured in the census with the an assumed 'right' theoretical age distribution. Low-capacity states should inaccurately round ages or inflate certain intervals, producing error. This error is usually computed in the Whipple's index which serves as a proxy for state capacities.

[54]Soifer [2012].

measurement of state capacities overtime. Unlike censuses, *unfortunately*, earthquakes happen very often. Yet, they are not well studied in the discipline. While "[e]arthquakes alone claim thousands of lives a year,"[55] "[d]isasters are not as well studied [...] in the field of political science."[56] Building on Mann [1984, 113], the proposed measurement captures state's 'infrastructural' power.[57] "Natural hazards can be seen as a function of a specific natural process and human [...] activity."[58] Given that earthquakes happen at random and are completely exogenous to the affected locality,[59] the only part that is left unexplained is the systematic human component, which is what the measurement captures. Earthquakes are orthogonal to levels of state and economic development development,[60] and by extension, they happen at any level of state capacity. Consequently, keeping earthquake magnitudes constant at their means, (weighted) death counts should be attributed to the (in)capacity of the states to invest in preparedness and mitigation institutions.[61] I focus on earthquakes and not on other natural disasters such as 'extreme temperature events, floods, landslides, and windstorms'[62] because earthquakes cannot be foreseen, and such, they put to a test the capacity of the states of having their preventive institutions *already* in place and in good shape. State capacities consist of sustained *proactive* efforts of enforcing institutions throughout the territory,

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

[56]Brancati [2007, 719].

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

[58]Raschky [2008, 627].

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

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

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

[62]Kahn [2005, 280].

and hence short-term *reactive* actions should *not* be considered state-*making*.[63] Moreover, unlike other natural disasters, earthquakes do not allow actors to adapt their behavior while the quake is happening. For example, in the case of famines, the institutions of "calamity relief in India [...] emphasize the need for local administrators to look for *signs*, such as large drops in food production and increases in food prices, which *signal* an impending crisis."[64] In fact, Brancati [2007, 716] explains that "[e]arthquakes may provoke conflict more than any other type of natural disaster *because* they have rapid onsets [and] are not predictable."[65]

The capacity states have of deploying inspectors throughout the territory to enforce quake-sensitive zoning and building codes is a reflection of the overall levels of a country's state capacity. Since "[e]arthquake-resistant construction depends on responsible governance,"[66] state capacities act as a scope condition, particularly, undermining or permitting 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"[67] in low-capacity states. For example, Anbarci et al. [2005, 1910] explain that "while Iran has building codes which are 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 of the deaths occurred in the 6.4 earthquake in Changureh in 2002.[68] The proposed measurement bridges this gap by incorporating and modeling the state's capacities of enforcing these codes at the subnational level. Critically, "[e]arthquake-resistant features are costly to verify after construction is complete [...] Steel reinforcement bars make a well-known contribution

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[63]In other words, other "natural disasters can be foreseen (or predicted with some probability) and thus measures can be taken to limit their severity" (Anbarci et al. [2005, 1908]).

[64]Besley and Burgess [2002, 1423]. Emphases are mine. In fact, as Kahn [2005, 273] points out to the very non-significant low correlation between predictable and unpredictable natural disasters.

[65]Emphasis is mine.

[66]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.

[67]Emphases are mine.

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

to earthquake resistance concretely buildings[,] not only is the steel itself invisible [...] but the durability of the steel depends on the quality and quantity of concrete around it."[69] This is the so called 'cover-up' concept: "inappropriate foundations can be hidden beneath walls, shoddily assembled steel work can be hidden beneath concrete [and] poorly mixed concrete can be hidden behind paint."[70]

Only states with higher capacities overcome their political and logistic limitations and successfully implement and enforce these regulations at the local level. The Chilean government started its efforts to ameliorate the impact of earthquakes after the great quake of 1928 in Talca. A first effort happened in 1929 when *Ley* number 4563 was implemented. The law was among the first attempts to prohibit "construction, reconstruction or any other repairing or transformations [...] without a permit from the authorities." Importantly, the law required that all blueprints had to be signed 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,[71] 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 figure of the *inspector* to supervise, enforce and monitor these measures at the local level. Furthermore, *artículo* 414 of the Chilean *Decreto* 4882 granted *inspectores* 'free access to the building' at any time during the construction process. My measurement picks up whether these good intentions written in paper actually scored lower death tolls when shocked by the average earthquake.[72] Particularly, I find that localities with higher levels of sectoral

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[69]Keefer et al. [2011, 1531].

[70]Bilham [2013, 167].

[71]See especially article 151.

[72]Thus, my measurement captures state outcomes. Fukuyama [2013] is very critical of 'outcome-oriented' measurements. However, this outcome is different. Unlike the proportion of tax over GDP which could end up being wasted (p. 353), or "educational outcomes [which depend] much more strongly on factors like friends and family" (p. 355), death tolls associated to earthquakes are *not* 'hard to measure' (p. 356) neither they are subject to 'normative' concerns. I also disagree in that 'econometric techniques' to control for these and other factors add 'another layer of complexity.' Similarly, Kurtz and Schrank [2012, 619] explain that the "problem [...] with output based measures is that they necessarily include information on policy choice." However, it would be hard to say that people's lives are subject to 'ideological' or 'policy preferences.'

contestation score lower death tolls relative to localities with lower levels of sectoral conflicts.

Properly enforced and implemented building codes, among other mitigation measures, not only save lives. These kinds of institutions embody the most basic form of social contract that exists between the state and its subjects. The collapse of commerce buildings and private houses trigger higher levels of looting and social unrest. States are interested in preventing looting and social unrest because elected officials, as the visible faces of *the* state, care not only about their electoral survival (or just 'survival' in the case of unelected officials), but also about the legitimacy of the whole apparatus. That is, in the event of social unrest, not only the essential social Hobbesian-like contract is broken but also the expectations for social peace and the ability of the state to monopolize physical violence are questioned.[73] 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 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.[74] Critically, under these circumstances, the legitimacy of the state, and particularly, the *tax state*, reduces to zero. Thus, officials (elected or not), care about the potentially negative outcomes the lack of building code enforcement might cause. For humanitarian or selfish reasons, it is in their best interest to make sure that these institutions are enforced throughout the territory. Should the state fail, its extractive enterprise will be the first one in being scrutinized.

This measurement has a number of advantages. Unlike survey-based or policy-based measures, earthquake death tolls are an *objective* measurement of earthquake

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[73]Others have studied how in some context earthquakes damage interpersonal trust. For example, Carlin et al. [2014, 419] argue that "state capacity plays a decisive role in determining natural disasters' consequences for social capital."

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

preparedness,[75] an activity that *any* state *must* perform.[76] 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." Additionally, Soifer [2008, 235-236] divides the state infrastructural power in three layers, 'national capabilities,'[77] the 'weight of the state'[78] and a 'subnational' component which tracks "the ability of the state to exercise control within its territory." Earthquake death tolls map well into all three components. Since death tolls are a function of how well/bad building codes are *enforced* by the state throughout the territory, adopting a subnational approach seems more appropriate. For instance, there might be excluded local elites that might not be willing to comply with national policies at the subnational level. The proposed measurement and theoretical framework capture these tensions, offering a theory for the conditions that foster subnational cooperation.

The measurement has a number of drawbacks, however. 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.[79] Moreover, there are countries, like India or the United States, where earthquakes happen in certain regions only. Presumably,

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

[76]I agree with Kurtz and Schrank [2012, 619] in that an "output-linked approach [...] should only examine public sector outputs that are not particularly politicized, and generally perceived to be essential state functions across a very broad set of states." 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."

[77]This layer 'sees state infrastructural power as a characteristic of the central state'.

[78]This relates to 'how the exercise of state power shapes the society it controls.'

[79]Keefer et al. [2011, 1534]. From a population size perspective, this measurement is also convenient. A "quarter of the world's population inhabits [...] the northern edge of the Arabian and Indian Plates that are colliding with the southern margin of the Eurasian Plate" (Bilham and Gaur [2013, 618]). Finally, other measurements also are contingent on the context. 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.' This strategy evidently shortens the sample to only democratic countries, introducing potential sample selection biases.

mitigation policies in these places would need to be targeted to specific areas, possibly undermining the assumption that the these kinds of policies should penetrate the 'entire' territory.[80] Another potential concern is that the ability of counting the death-toll might be a function of state capacities itself.[81] However, 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 casualties. Another potential issue has to do with the measurement of the magnitudes. Before the instrumental period, magnitudes were obtained in an estimative way. And while there are methods to approximate historical felt magnitudes to instrumental-like intensities,[82] this unfortunately adds more than one layer of complexity. All in all, this measurement offers a rough approximation of levels of state capacities overtime. And while some econometric techniques might ameliorate some of the problems, it is unlikely that they disappear completely.

4.3   Multilevel Analyses

I constructed a novel dataset using the *Significant Earthquake Database* compiled by the National Centers for Environmental Information (NOAA) as a starting point.[83] The dataset 'contains information on destructive earthquakes from 2150 B.C. to the present,' and records the number of deaths,[84] the magnitude and year, and the latitude and longitude of every quake, among other information. Using archival census data from 1907 to 2012,[85] I complemented the NOAA dataset with local population at

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

[81]If this were true, states with higher capacities would have higher death tolls, while states with lower capacities, due to their incapacity to count, lower death tolls.

[82]Szeliga et al. [2010].

[83] [NGDC/WDS].

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

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

the municipal level where the quake hit. This way I am able to weight the death toll by local population.[86] Using archival census data as well, I also considered the main economic activity of the affected municipality,[87] and also whether the municipality was urban or rural.[88] The death tolls and magnitudes proportionated by the NOAA dataset were contrasted case by case with historical press archival information.[89] 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 proxy sectoral conflicts at the national level. Following Bahamonde [2017b] and Bahamonde [2017a], I proxy national sectoral competition and specifically the degree in 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 4.2, bottom panel).[90] 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 4.3), the economic data provided by MOxLAD limits the scope of this paper from 1903 to 2007 (Figure 4.2).

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[86]While 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 the population variable as a control variable, not to construct a dependent proportion variable.

[87]Agricultural, industrial, or mixed (i.e., both agricultural and industrial).

[88]If more than 50% of the population lives in an urban setting, I assigned a 1 to that municipality, 0 otherwise. Urban concentrations are more likely to have vertical constructions rather than one-story buildings, increasing the potential number of casualties. I thank Daniel Kelemen for this suggestion.

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

[90]"These data build on the studies and statistical abstracts of the Economic Commission for Latin America, but also rely on Mitchell's International Historical Statistics, International Monetary Fund's International Financial Statistics, the World Bank's World Development Indicators and a variety of national sources." I used the *agriculture value-added* and *manufacturing value-added* variables. The former measures "the output of the sector net of intermediate inputs and includes the cultivation of crops, livestock production, hunting, forestry and fishing." The later "[r]eports the output of the sector net of intermediate inputs." Both of them are expressed in local currency at 1970 constant prices.
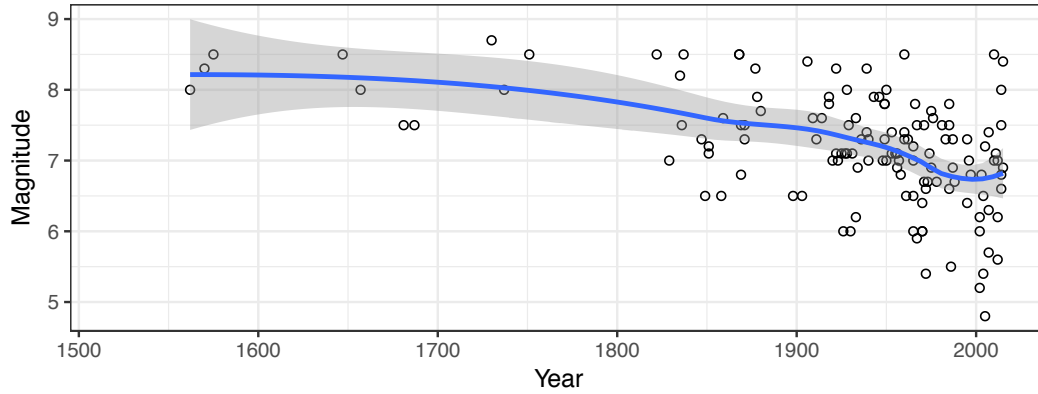
Figure 4.3: Earthquakes in Chile: 1500-2010

Chile is a good case to study infrastructural state-capacities using this earthquake dataset since it has considerable variance regarding quake magnitudes and locations. Figure 4.3 plots the earthquakes, the years and the magnitudes, while Figure 4.4 plots the geographical distribution and magnitudes of the quakes. For illustrative purposes, both plots consider the full sample starting in 1520 and ending in 2015. 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 as well. Chile is arid in the north, limiting agricultural activity, but it has a temperate oceanic climate in the south, a more appropriated climate for agriculture. Also, distance from Santiago, the capital city located in the middle (around latitude 33°) might impose some degree of difficulty for the central government to reach out the farthest northern/southern parts of the territory. All in all, given that earthquakes happen at various latitudes and in different magnitudes, both regions have been exposed indistinctly to a wide range of shocks. 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.[91] However shocks have affected the territory from coast to mountain.[92] In sum, quakes

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

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

have shocked the country as a whole regardless of longitude and latitude, distance from the center, type of climate and main economic activity.
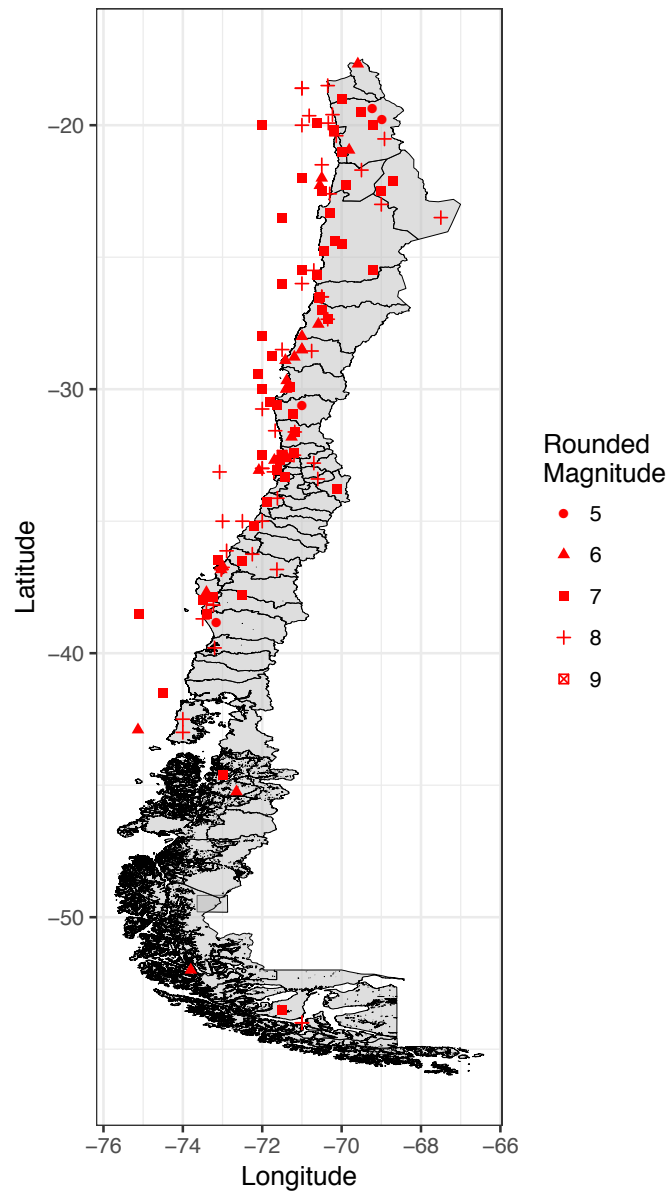

Figure 4.4: Geographical Distribution of Earthquakes in Chile 1500-2015

The unit of analysis is the earthquake.[93] As an event, each earthquake has attached to it, a death toll, a subnational location identified by its latitude and longitude, a

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

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, using a Bayesian Poisson regression,[94] I model the count of dead individuals caused by earthquakes. Since I am interested in testing the effect of different sources of sectoral contestation, both national and subnational, on death-tolls overtime, 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. I also included year fixed-effects to account for time-varying confounding factors.[95] For instance, fiscal development could be a function of country-specific prior state-building capacities. Fixed-effects should be able to account for these and other unmeasured yearly factors such as the evolution of the political system, demographic, climate and cultural changes as well as economic shocks (both national and international). I also included latitude to control for the proximity to the Andean mountains. This variable controls for a built-in tectonic predisposition to earthquakes, and longitude 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 of the state in reaching these parts of the country.[96]

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

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

[96]Undoubtedly, there are many more factors that might increase the 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 data on the hour of the shock. 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 in 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 overtime. However, the year fixed effects could pick up at some extent these unmeasured components.

More formally, I fit the next equation,

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

$$log(\lambda_i) = \mu + \beta_{1_j}\text{Proportion}_i + \beta_{2_j}\text{Magnitude}_i^2 + \beta_3\text{Latitude}_i + \beta_4\text{Longitude}_i +$$

$$\beta_5\text{Population}_i + \beta_6\text{Urban}_i + \beta_{7_t}\text{Year}_i$$

$$(4.1)$$

where,

$$i_{1,...I} \text{ where I} = 91$$

$$j_{1,...J} \text{ where J} = 3$$

$$t_{1,...T} \text{ where T} = 59;$$

the i subscript denotes the unit of analysis (i.e. earthquake),[97] the j index expresses the type of subnational economic composition of the affected municipality (agricultural, industrial, or mixed), and the t subscripts denotes the year when earthquake i happened. Also, since earthquakes can happen more than once per year, in my dataset $I > T$.[98] Finally, μ is the intercept. Since the 'treatment' (sources of sectoral contestation) occurs simultaneously at the national and subnational levels, I implement a multilevel model.[99] The multilevel component of Equation 4.1 allows the slope of the national proportion of agriculture relative to industry (β_{1_j}) to vary by the jth dominant subnational sector. Due to space constrains, 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 also modeled magnitude with different slopes (β_{2_j}).[100] The results strongly suggest that there is not a self-selection mechanism

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

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

[99]Gelman and Hill [2006, 237]. I do not claim in any way this is a causal method.

[100]According to the NOAA, an "increase of one in magnitude represents a tenfold increase in the recorded wave amplitude." Consequently the effect of this variable should not be linear. Consequently, both in Equation 4.1 and Equation 4.2 I consider the square term of magnitude.

in the data generating process. Nearly-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. Finally, the estimated parameters β_k have non-informative normally distributed priors,[101] while precisions τ_p of β_{1_j}, β_{2_j} and β_{7_t} have noninformative Gamma priors.

More formally, I considered the following:

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

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

Do higher levels of sectoral contestation translate into state development?

Table 4.1 shows the posterior predictive distributions of the multi-level Bayesian Poisson regression, particularly, the predicted death counts conditional on observed covariates. The main quantity of interest is β_{1_j}, the coefficient on $\frac{\text{Agriculture}}{\text{Industry}}$ with different slopes, one per type of subnational sectoral predominance. The results strongly suggest that as the relative size of agriculture increases, the death toll increases. Given the initial advantage of the agricultural sector, as agriculture keeps developing rapidly leaving the system unchallenged, national sectoral contestation decreases. Under these circumstances the death toll increases by 13 when the subnational locality is *also* agricultural. This scenario exemplifies a situation where agricultural elites are the main national *and* subnational hegemonic elite. However, as the national proportion of agriculture expands *in the presence of strong industrial subnational clusters*, the death-toll decreases by 16. To ease meaningful interpretation of these results, Figure 4.5 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.

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[101] "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]).

	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 4.1: Sectoral Competition Model: Simulated Posterior Predictions (Poisson Regression)

Substantively, these results strongly suggest that sectoral contestation conceptualized at both the national and subnational levels had a positive effect on state-building. These results are relevant since the capacity the state has of enforcing and monitoring building codes throughout the territory is affected by local differences in subnational contestation. Should these subnational sources of contestation not be translated into sectoral agreements, the country risked seeing the emergence of local bosses. These local authorities for instance might not be interested in implementing building codes coming from Santiago. In line with my theoretical expectations, I find that these threats fostered inter-sectoral agreements when levels of inter-sectoral inequality were low. For instance, historical evidence suggests that Chilean industrial elites made political compromises with agricultural elites in exchange of having more state services and being

allowed to participate in politics under fairer conditions. This kind of sectoral incorporation into the national project was possible contingent on the capacity the new elites had of overthrowing the institutional order that permitted hegemonic groups to rule without opposition. These results find empirical support for the positive relationship between the emergence of *local* industrial clusters and higher levels of state-capacities. However, they do not tell us how these sectoral dynamics impacted state-capacities *overtime.* That is what I do next.
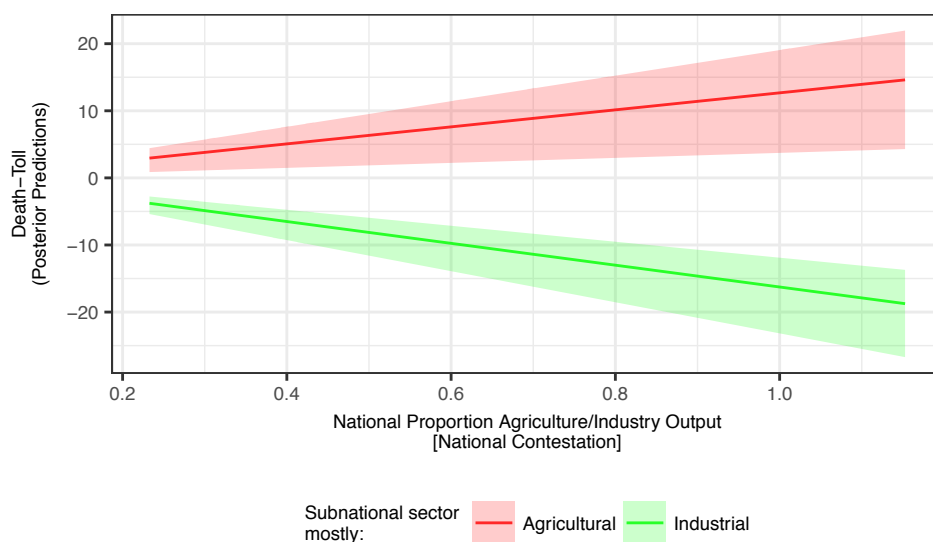

Figure 4.5: Death-Toll by National and Subnational Sources of Sectoral Contestation

Did taxation cause state-making overtime?

I argued that lower levels of inter-elite inequality led to higher levels of sectoral contestation, fostering inter-elite compromises. In this paper I identified one such compromise, the implementation of the income tax law. It was argued here that the implementation of the income tax had positive externalities for state-building overtime. Following the same setup and using the same dataset, I fit a simpler one-dimensional Poisson model. The only complexity that was kept were the year fixed-effects. The main difference is the inclusion of an indicator variable that denotes whether in year t the income tax had been implemented or not, and whose estimated parameter is the main quantity of interest now. Just like before, the structure of the prior mean and precision of

$\beta_1 \sim \mathcal{N}(0, 0.01)$. The rest is the same.

More formally, I fitted the next equation:

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

$$log(\lambda_i) = \mu + \beta_1\text{Income Tax}_i + \beta_2\text{Magnitude}_i^2 + \beta_3\text{Latitude}_i + \beta_4\text{Longitude}_i + \quad (4.2)$$

$$\beta_5\text{Population}_i + \beta_6\text{Urban}_i + \beta_{7_t}\text{Year}_i$$

Table 4.2 also shows posterior predictive distributions. The results show that implementing the income tax overtime *decreases* death-tolls by 3. The effect is small. This might be due to the short dataset. Figure 4.6 shows the disaggregated effects overtime, and how death-tolls (state capacities) do vary, and particularly, *decrease* (increase) overtime. Before the income tax law was implemented, death-tolls were relatively stable, averaging 28 casualties approximately per earthquake. However, once the income tax law was implemented, the death-toll declined 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 4.2: Income Tax Adoption Model: Simulated Posterior Predictions (Poisson Regression)

The endogenous capacities of efficiently monitoring individual incomes and deploying bureaucracies throughout the territory to collect these taxes were transfered to other state institutions via spillover effects. This has been a long-time claim of the fiscal sociology. Here find support for these claims. The implementation of the income tax law in Chile increased the capacities of the state of monitoring and enforcing building codes. The relationship between collecting revenue and getting good at is an endogenous one. The 'big push' or definitive set of initial incentives to monitor personal incomes to convert them into public property was mobilized by the incentives of capitalizing increasing industrial incomes (see Figure 4.2, top panel).

Following the fiscal sociology, I contend that unlike other regular state institutions and services, taxing incomes *required more* from the state, producing a secular accumulation of know-how. Indirect taxation demands less from the state. It suffices to establish a staffed office in all ports of entry. However, direct taxation requires sending government emissaries to the whole territory. The cumulative expertise of know*ing*-how to send and keeping accountable local skilled tax emissaries was transfered to other audit bodies of the state. Historical evidence suggests that the treasury did increase the Chilean fiscal coffers right after the implementation of the income tax law in 1924. This suggests that there was also a denser state presence at the local level, materialized mainly in official visits that were sent from the capital to other regions. As the Chilean state solved its logistical and political difficulties to do so, it generated the necessary routines and standard procedures, applying the same norm throughout the whole territory. For instance, it was necessary 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 and other public services were added, such as doctors, judges, land surveyors to solve land disputes, and engineers to check whether ongoing repairings or edifications followed the national building norms. Similarly, Strayer [2005] for instance explains how official state delegations traveled the territory dispensing judicial decisions, something that eventually generated the systematization, centralization and -importantly- the monopoly of justice provision by the state. In sum, I find that

the act of *sending* bureaucrats to other parts of the territory to collect taxes had positive externalities on other state activities. Here, I identify one of these activities, the enforcing of national quake-sensitive norms.
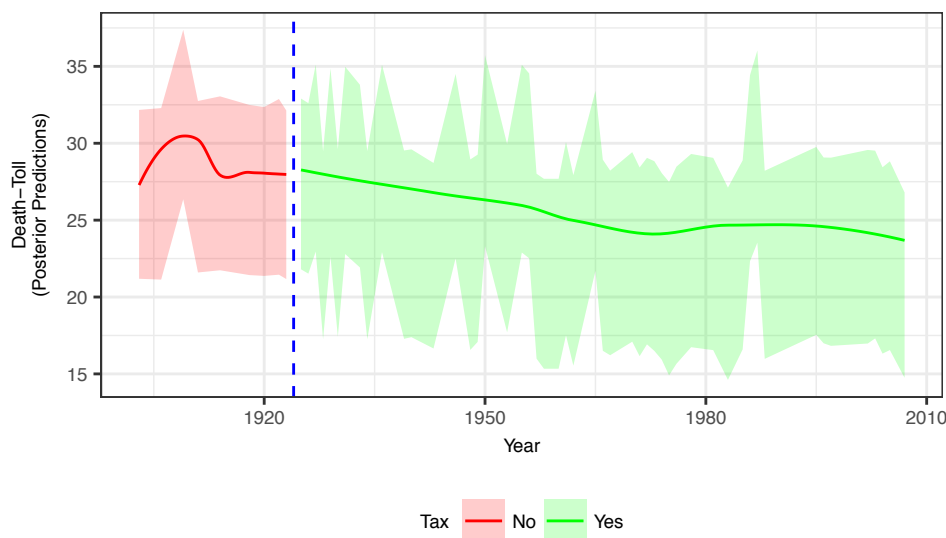

Figure 4.6: Death-Tolls Over Time: Before and After the Implementation of the Income Tax

4.4 Discussion

I argued that higher levels of sectoral competition, both nationally and subnationally conceptualized increased state-capacities over time. Specifically, I explained how the emergence of industrial elites lowered levels of inter-sectoral inequality, pushing the agricultural and industrial elites to reach agreements that materialized in investments in state-making institutions, fostering higher levels of state-capacities. What my empirical analyses showed were twofolds. Death-tolls decrease (state capacities increase) when levels of national/subnational sectoral contestation increased, and once the income tax law was implemented. This last finding in particular finds support for the fiscal sociology paradigm, namely, direct taxation had positive externalities on state-capacities. This paradigm focused on the intertwining of the development of the fiscal state and sectoral-economic conflicts. Here I argued that 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. Elite incorporation was possible contingent on the capacity the new elites had of overthrowing the institutional order that permitted hegemonic groups to rule without opposition. And also, it was contingent on the benefits industrial obtained out of complying with the income tax, particularly receiving infrastructure that benefited industrial expansion at the subnational level.

I also introduced a novel framework that leverages the exogeneity of earthquakes to capture how the Chilean state has been able to enforce a number of regulations that sought to norm the construction and infrastructure sectors. The capacity the state has of enforcing these institutions is a projection of *overall* state capacities. Importantly, local differences in subnational contestation affected how these national norms were implemented. The measurement is not confounded with levels of economic growth or type of regime either. The measurement has a number of limitations. However, it serves as a rough butt good proxy of state capacities. Future research should apply this measurement to other countries, and if possible, with a larger time span.

Chapter 5

Conclusion

In these three essays I have sketched a theory of political and economic development focused on sectoral contestation. I have payed especial attention to the role of inter-sectoral inequality. The first essay explains how the emergence of the industrial sector lowered levels of inter-sectoral inequality, fostering inter-sectoral alliances and compromises. I focused particularly on the implementation of the income tax law. My empirical analyses showed how industrial expansion accelerated the implementation of the income tax law. Leveraging the Chilean case, I show some historical evidence that suggests that industrial elites accepted to be income taxed in exchange of state services, access to state power and local public goods. The second essays builds on the first one, and explains the long-run consequences of implementing the income tax law under conditions of sectoral contestation. Using Granger-causality tests and VAR models, I find that the income tax reversed the backwards institutions that had sustained the hegemonic political economy of the landed elites. Where the economic cleavage was weak, the income tax did not reverse these institutions, leaving the old institutional order unaltered, compromising both economic and political development in the long-run. Finally, the third essay, using a novel dataset on Chilean earthquakes (to proxy state capacities over time), finds support for the fiscal sociology theory. The earthquake framework explains how the capacity of enforcing building codes at the subnational level is a reflection of general state-capacities. Importantly, earthquakes happen at any level of economic and political development. Consequently, death-toll differentials should be attributed to state capacities only. I found that the income tax law increased state capacities over time, and that subnational sources of sectoral contestation increased

subnational state-capacities. First, elites will be willing to implement nationally conceived institutions if they see a benefit. I explained how the implementation of the income tax law required sectoral alliances with the subnational level. Particularly, industrialists agreed to pay the tax in exchange of the delivery of local public goods such as roads, railroads, and other infrastructure that was beneficial for the industrial sector. Once the income tax is implemented, I find that death-tolls decrease (state-capacities increase) over time. Second, I explained how higher levels of subnational contestation increased the subnational ability of enforcing building codes throughout the territory. In particular, these sources of contestation increased levels of sectoral threats that materialized in the emergence of caudillos and other local bosses. Consequently, it was in the best interest of agricultural incumbents to include subnational industrial elites into the national project. Industrial elites accepted to enforce these institutions at the local level in exchange for representation.

Future research should explore other avenues of sectoral compromise, include more historical evidence on other countries of the region, and expand the earthquake dataset, both in time and geographical scope.

Chapter 6

Appendices

6.0.1   Second Essay Appendix

Country	Available Data	Year Income Tax	Law	Source
Chile	1900 - 2009	1924	*Ley* 3996	Mamalakis [1976, 20] and LeyChile.Cl (official)
Colombia	1900 - 2009	1935	*Ley* 78	Figueroa [2008, 9]
Argentina	1900 - 2010	1933	*Ley* 11682	Infoleg.Gob.Ar (official)
Mexico	1900 - 2009	1965	*Ley de Impuesto sobre la Renta*	Díaz González [2013, 130-133] and Diario Oficial (official)
Nicaragua	1920 - 2009	1974	*Ley* 662	Legislacion.Asamblea.Gob.Ni (official)
Guatemala	1920 - 2009	1963	*Decreto* 1559	Instituto Centroamericano de Estudios Fiscales [2007, 165]

Table 6.1: 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	4.601 (1.00)	5.552 (1.00)	.288	I(1)
		Industry	5.803 (1.00)	10.776 (1.00)	.29	I(1)
	Post	Agriculture	0.599 (0.9876)	0.497 (0.99)	.109†	I(1)
		Industry	-1.255 (0.65)	-0.982 (0.76)	.113†	I(1)
	All	Agriculture	3.431 (1.00)	3.607 (1.00)	.341	I(1)
		Industry	0.672 (0.99)	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 6.2: 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 6.3: Lag Length and Post-Estimation Results

6.0.2 Third Essay Appendix
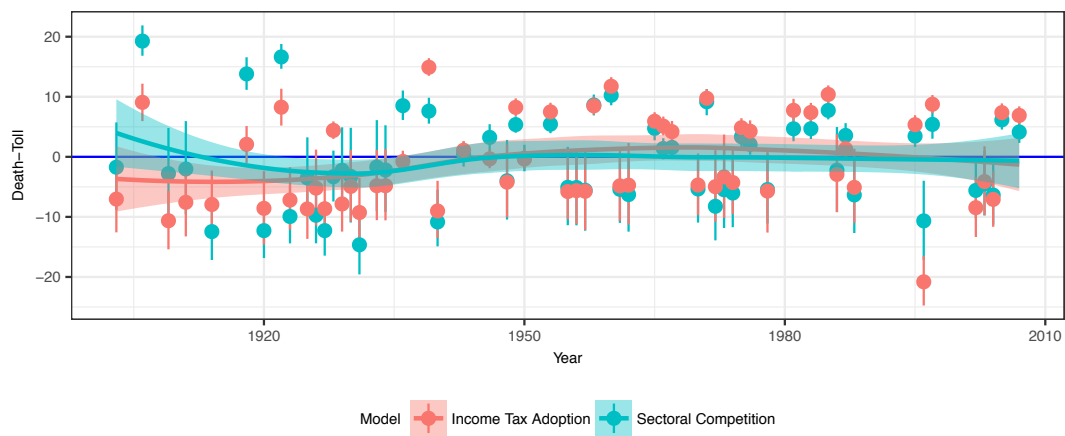
Figure 6.1: Year Fixed Effects

Figure 6.2: Assessing Model Fit

Figure 6.3: Trace Plots: Sectoral Conflicts Model

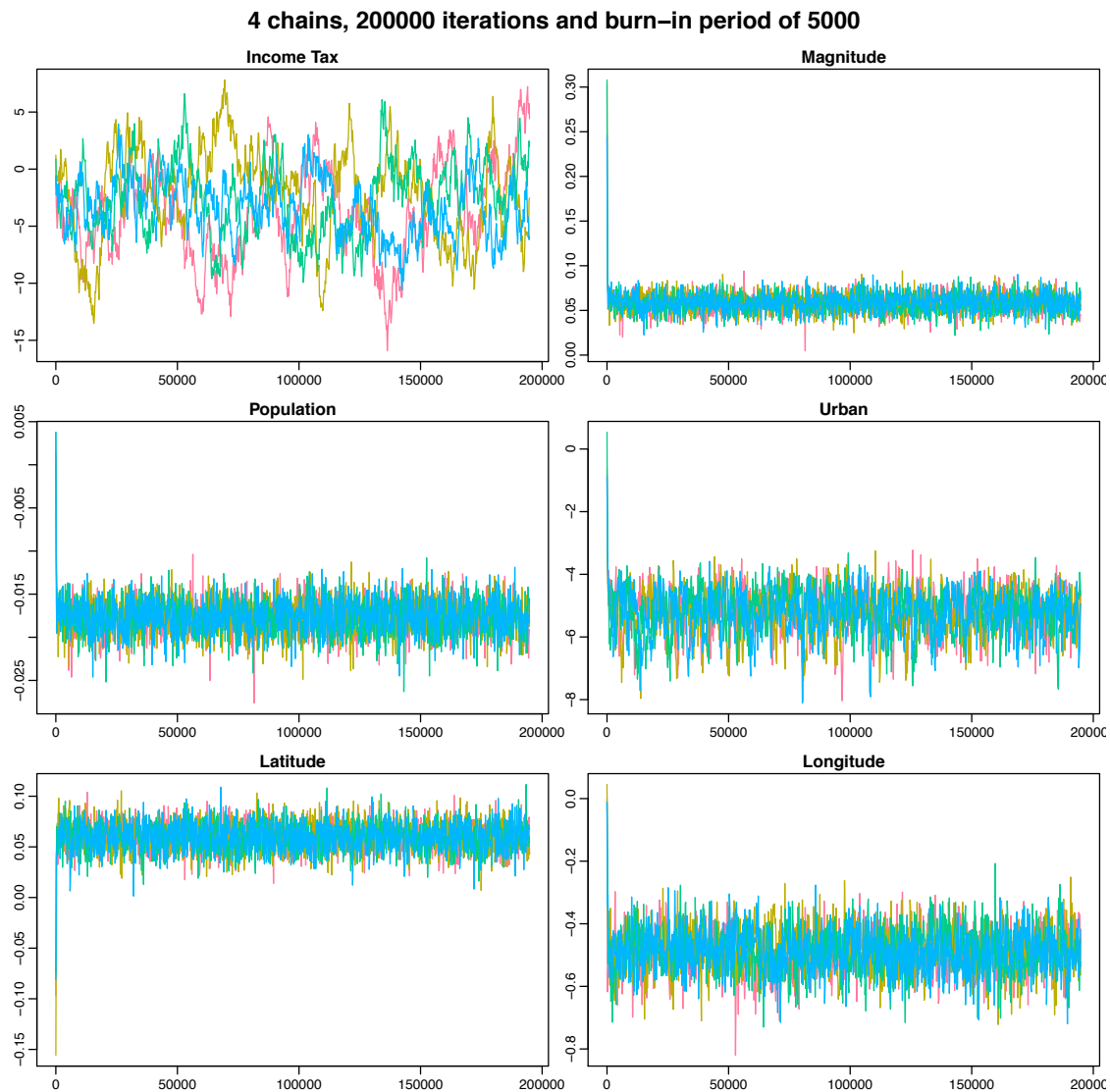**4 chains, 200000 iterations and burn−in period of 5000**

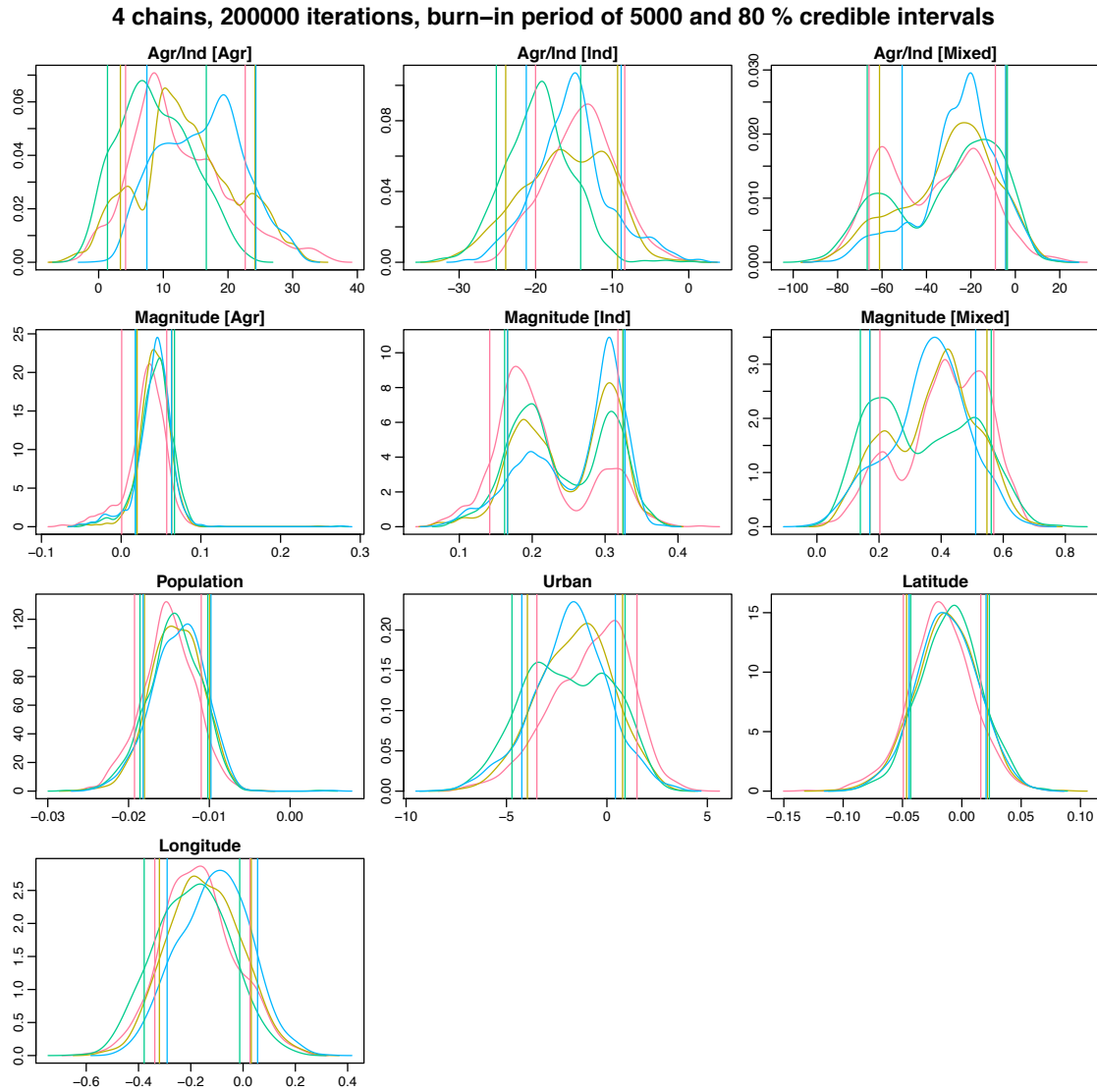Figure 6.4: Trace Plots: Income Tax Adoption Model

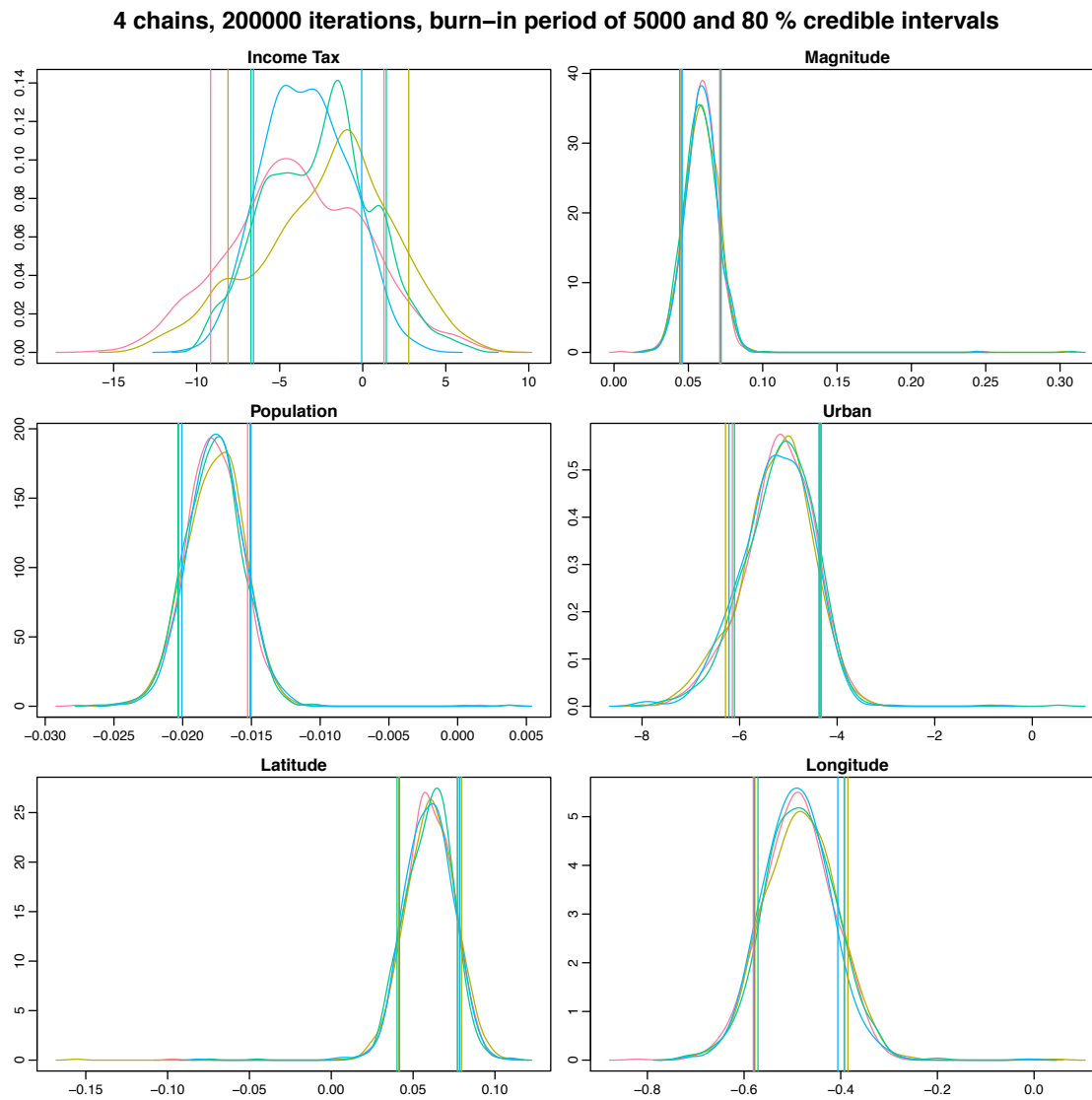Figure 6.5: Density Plots: Sectoral Conflicts Model

Figure 6.6: Density Plots: Income Tax Adoption Model

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