

The Executive Dilemma: the
Bargaining for Education in
Decentralized Brazil

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Preamble

“We suffer, but those who lose are our students.” - Anonymous teacher, municipality of Icó.

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Introduction

```
source(  
  here::here("scripts/thesis_setup.R")  
)  
  
source(  
  here("scripts/thesis_map.R")  
)  
  
## OGR data source with driver: ESRI Shapefile  
## Source: "/home/gali/princeton/dissertation/thesis/data/maps", layer: "municipio"  
## with 5507 features  
## It has 20 fields  
  
## Regions defined for each Polygons  
  
import_data(  
  here("data/saeb"),  
  "saeb_exam_mun"  
) %>%  
  assign_data
```

In the municipality of Icó, children ran through the doors of the public school Conselheiro Araújo de Lima to start their instruction. The school, one of fourteen serving the local population, has consistently struggled to improve the quality of its public education. Many of its children are functionally illiterate, knowing only how to read and write their name. Math operations and critical

reading was a privilege of the few. In Brazil, as in many countries across the world, low quality, public education is unfortunately commonplace. It is not, however, the only possible scenario.¹

Only one hundred miles away, in the municipality of Sobral, children complete their path through public education acquiring a diverse set of skills. Classrooms in its public schools reverberate with the sound of children reciting poetry, its walls covered with visual aids to teach them the concept of fractions. Many of its students move on to pursue higher education in the prestigious, public universities of the state capital, competing for spots with students from private schools in Fortaleza. In both municipalities, the majority of its children are enrolled in public schools. The quality of education they receive is, however, highly unequal.

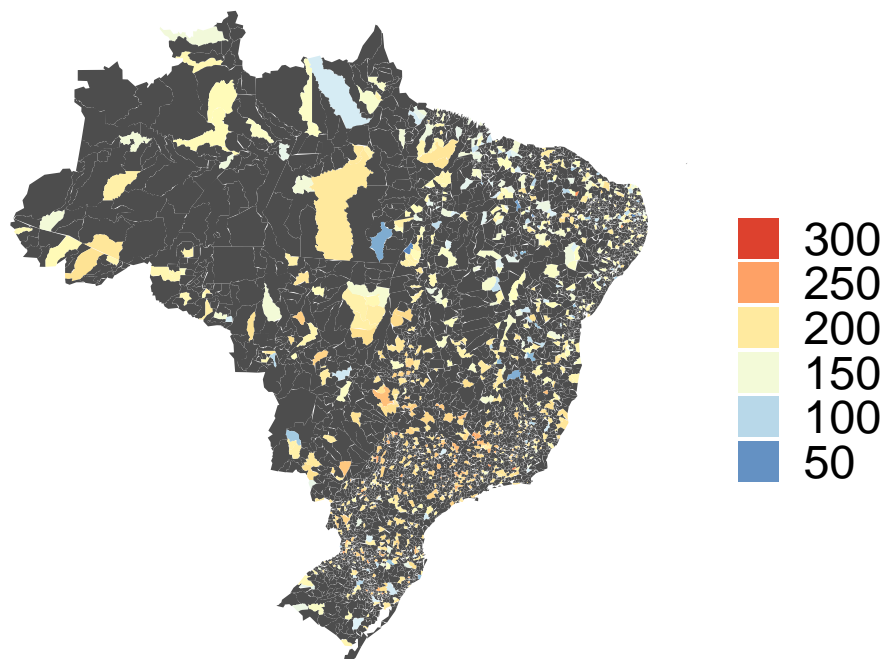
These contrasting cases illustrate a global phenomenon. Across the developing and developed world, vulnerable populations rely on governments for routine access to satisfy basic needs such as healthcare and education. These public services are nominally universal. As a result of the global expansion of the welfare state, a majority of citizens now enjoy access to them. But this nominal access is fraught with inequality: the quality of these services is spread unevenly, with some communities enjoying access to high-quality public education for their children, while others do not. What explains variation in the quality of public services? Why, within the same country, do some communities enjoy better public service delivery than others?

```
map_score <- map_br %>%
  mutate(
    cod_ibge_6 = as.integer(cod_ibge_6)
  ) %>%
  left_join(
    saeb_exam_mun %>%
      filter(
        year == 2015
      ),
    by = c("cod_ibge_6")
  )

plot_map(
  map_score,
  fill = "mean_grade_exam_wgt",
```

¹*Insert citation here.*

Student test scores: municipal average (2015)



Source: National System of Education Evaluation (SAEB).

Figure 2.1: Each polygon represents a municipality. Average test scores are calculated through an arithmetic mean of the test scores for all students enrolled in the municipal public education for the 2015 edition of the Prova Brasil, conducted by the National Institute for Education Research (INEP).!

```
title = "Student test scores: municipal average (2015)",
caption = "Source: National System of Education Evaluation (SAEB)."
```

Measure dispersion of test scores across municipalities vs. across states

The map in figure ?? provides a visual representation of the inequality of public education received by public students in municipalities across Brazil.

Discuss how wide the spread is, intra-state variation

This dissertation provides a micro-level theory of political actors and their strategic incentives to improve or not these services, through managerial deci-

sions over bureaucratic personnel. In doing so, I leverage insights from a set of theoretical lenses: electoral accountability, state capacity, and more recent developments in personnel economics.² I trace variation in the quality of public services to the bureaucracies responsible for providing them.³ Clearly, these organizations do not operate in a vacuum: political actors can and do decide to alter them, for better or for worse.⁴ To understand these decisions, I model their incentives.

Given the prominence of local governments since decentralization, I explicitly theorize mayor's strategic choices, embedded in an electoral accountability framework.⁵ In doing so, I build on the seminal work of ?, who models bureaucratic reform as an executive decision.⁶ In countries across the world, executive leaders enjoy wide latitude in whom to appoint into and dismiss from bureaucracies.⁷ However, these leaders seldom govern alone, and often their decisions over bureaucracies are shaped by their interaction with a legislative body.⁸

This dissertation asks an overarching question, which I decompose into three interconnected inquiries. Under what conditions do local politicians reshape bureaucratic structures to improve the quality of the administrative staff responsible for public service delivery? To answer this, I proceed through backward induction, looking first at the electoral payoffs of improving public service delivery. Are mayors rewarded for improving public service delivery, when running up for reelection? Second, what consequences do practices associated with personnel management, such as bureaucratic turnover, have over public service delivery? Finally, how does the executive-legislative bargain affect personnel decisions? How does the need to negotiate with legislative actors, exchanging public sector jobs for budgetary support, shape bureaucratic turnover?

In seeking for evidence to answer this inquiry, I have collected and systematized an exhaustive dataset on all bureaucrats hired by municipal governments in Brazil from the transition to democracy (1988) to 2015. This dataset contains information about managers and street-level bureaucrats, providing us with

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⁴?, ?.

⁵For seminal works on this tradition, see ?, ?.

⁶Here, and throughout the dissertation, I refer to the mayor with the female pronoun.

⁷In the United States, this practice is often referred to as the Plum Book. In Brazil, mayors can appoint and dismiss bureaucrats, with the notable exception of civil servants who comprise (a rapidly falling) majority of teachers.

a radiography of the administrative innards of Brazil's localized state.⁹ I have structured an electoral dataset containing all politicians, mayors and city councillors, across all municipalities: this allows me to follow their political trajectories as they reshape bureaucracies through their managerial decisions. Finally, I provide measures (albeit imperfect) of the quality of public services: student test scores and infant mortality rates provide us with estimates of how well public services are operating at the local level.

For scholars analyzing states in the developing world, often performed in a historical institutional framework, data collection and systematic analysis demands a herculean effort. For contemporary analysis of state bureaucracies, the task is similarly daunting.¹⁰ As public services and administration have become increasingly decentralized, states have often failed to provide scholars and policymakers with data to analyze these changes. Brazil is a felicitous exception. With an unparalleled wealth of data, I can provide a radiography tracing each personnel decision made by every elected mayor in Brazil from 2000 to 2016.¹¹ Over 5 thousand mayors taking office for each electoral cycle, accompanied by 30 thousand city councillors, and an average of 5 million bureaucrats work in each of these municipalities, and we have data for all of them.

The time is ripe for a nuanced mapping of the divergent developmental paths of municipal public service delivery. Government provision of public services are the primary bloodline of those citizens born in poverty, and most desperately in need. As I later document, these are also where the worst quality healthcare and education services are provided. Understanding the roots in deficiencies in public service delivery demands theoretically and empirically grounded analysis. Ultimately, the welfare of citizens across the developing world depends on a better understanding of how these public service delivery systems are managed. Over this, the shadow of politics looms large. To confront it, we must shed light on it.

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¹¹Note that electoral data prior to 2000 is still incomplete and an ongoing effort by the Brazilian electoral court.

2.1 The debate

In this introductory chapter, I lay out the theoretical debate which this dissertation engages with and contributes to. Due to the relatively large scale of this project, it intersects with multiple bodies of literature, which cannot all be addressed in the bounds of this chapter.¹² I opt to focus, in this introduction, on three main literatures which my theoretical argument speaks directly to. I first provide an analysis and critique of the Weberian model of bureaucracy, pushing for an explicit theorization of political administration in the developing world. The second body of literature focuses on the role of institutional legacies in determining state capacity, where I propose an agency-based theoretical approach to model dynamics of change in bureaucratic institutions.

Finally, I address the ways in which decentralization problematizes previous analyses of state institutions, while opening new avenues for theoretical and empirical inquiry. The Pandora's box of subnational heterogeneity, the "brown areas" as noted by ?, are a recent phenomenon. These are the result of political decisions reshaping administrative institutions at the subnational level, and as these responsibilities have been increasingly transferred to local politicians, understanding who they are, what are their strategies and payoffs becomes paramount to explaining variation in the quality of public services at the municipal level. To understand contemporary state capacity in an increasingly decentralized developing world, we must go local.¹³

2.2 From Weber's shadow to political administration

Traditionally, analysis of public administration and bureaucracies in particular has drawn heavily upon the works of Max Weber.¹⁴ In the early 1980s, with the bringing back of the state and its administrative institutions, political scientists derived important lessons from Weber's description of the bureaucratic organization. Bureaucracies in the *modern* state were impersonal, rule-based, specialized. The state analogy to the capitalist enterprise, the bureaucracy

¹²I address particular bodies of literature in their relevant thematic chapters throughout the dissertation.

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2.2. FROM WEBER'S SHADOW TO POLITICAL ADMINISTRATION 13

was a calibrated, efficient machine with professionalized servants.¹⁵ Politics was not to mix with administration: administration, above all, was to be kept public.

Adapting this ideal-type to contemporary states, scholars mapped Weber's typology of bureaucracy as signs of a bureaucracy up to the standards of a strong, modern state.¹⁶ Among these features were an increasingly professionalized public workforce, sometimes conflated with the expansion in the number of civil servants through its territory.¹⁷ One characteristic became especially salient as concerns expanded over political overreach: bureaucratic autonomy. Calls for a bureaucracy separate from political vicissitudes, an administrative apparatus insulated from myopic elected officials, became commonplace, especially in the developing world.¹⁸

I will not provide an exhaustive treatment of the subject. Rather, I will focus on its general contours and how this conceptualization has limited political science in theoretically modeling and empirically analyzing public administration. In simple terms, bureaucratic autonomy denotes the protection of bureaucratic institutions from political manipulation by governing officials, be them democratically elected or not.¹⁹ It also denotes a certain degree of esprit de corps, an institutional cohesion that is derived from a sense of common purpose and longevity. This cohesion would be difficult to achieve if politicians could interfere with its internal workings every electoral cycle.²⁰

A conceptual wall was built to separate the ideal-type of a Weberian, autonomous bureaucracy, free from political interference, and a world in which patrimonialism, the private use by politicians of public administration leads to corruption and inefficiency.²¹ Other scholars, searching for empirical validation for these claims, provided historical qualitative and quantitative evidence that bureaucratic autonomy caused rapid economic growth and industrialization.²² These often normative claims on the need for depoliticized administration was contested, leading to heated debates over its merit - principally in the developed world - with the counterpush of New Public Management (NPM)

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¹⁸Ironically, this was the exact opposite of what Weber posited in his description of bureaucracies, which were expected to conform to the mandate of political rulers.

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²²?, ?.

principles and the need for bureaucratic accountability to elected officials.²³

The debate on the desirability and consequences of bureaucratic autonomy in the developing world is *not* the one which this dissertation seeks to address. It proposes a new one. A systematic exploration of political administration, and the consequences of its various manifestations on the quality of public services. Politicians can and may dismantle bureaucracies, populating them with political loyalists who are unfitted for their positions.²⁴ That is not the only possible scenario. It may very well be the case that politicians can exercise management decisions in the service of improvements in bureaucratic structures, hiring meritocratically and improving the quality of these organizations.²⁵

It is time to destigmatize political decisions over reshaping bureaucracies. Proponents of an autonomous civil service underemphasize the fact that these institutional reforms are the products of decisions made by politicians.²⁶ Moreover, we still know surprisingly little about how electoral concerns in particular and accountability more broadly affects political decisions on how to manage bureaucracies.²⁷ This dissertation represents an effort towards that direction, aligning itself with a growing literature on the political decisions to restructure bureaucratic structures.²⁸

Inserting public administrations within a political context necessarily puts them in motion. In the next section, I address the question of agency and structure. Inevitably, placing politicians as central actors reshaping the state's bureaucratic innards dialogues with a large literature on its historical institutional determinants.²⁹ In this body of work, state institutions are often assumed to be slow-moving and not particularly amenable to short-term changes.³⁰ In broad terms, this assessment is correct: it is hard for individual leaders to effect dramatic changes in the state. However, if we refine our analysis to particular branches of the bureaucracy, and in particular municipal bureaucracies, change is clearly the rule, not the exception.

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²⁶While ? emp# References:hasizes the role of technocrats negotiating with politicians, ? highlights how investments in state capacity is an executive dilemma.

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²⁸?, ?, ?.

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³⁰See, for instance, the excellent discussion in ?.

2.3 An agency-based approach to state capacity

Traditional accounts of state capacity, and bureaucratic institutions in particular, have emphasized reproduction and path-dependence over change.³¹ These analytical tools provide limited leverage in analyzing different cycles of political administration - which align with electoral terms, as I later demonstrate - yet it is important to address their empirical contributions and theoretical assumptions. This dissertation dialogues with but ultimately parts ways with them. There are good reasons to emphasize and model change over reproduction, specifically in the context of executive actions over bureaucratic structures at the municipal level, which I outline in this section.

Note that agency-based change in state capacity does not imply an ahistorical lens. The institutional legacy of previous administrations is an important factor affecting the next political administration's decision. Once in office, politicians take into account inherited bureaucratic structures when restructuring them. However, these legacies do not exhaust the set of causal variables explaining bureaucratic structures at time $t + 1$. They are but one of the factors that politicians take into consideration in their decision-making, along with other time-varying factors such as legislative control, electoral payoffs to improvements in public service, and the individual characteristics of politicians.³²

I provide a review of extant literature on the prevalently historical-institutional analyses of state capacity, with a strong focus in the developing world. From the hapless origins in colonial exploitation, the absence of generalized war to contemporary structurally engendered practices of clientelism, there seems to be little current policymakers and scholars can do to effect positive, short-term change in state capacity.³³ Currently weak states have little to do today and much to blame for their unfortunate past. This leaves policymakers and scholars alike baffled as to how to enact policy reforms that can have a positive effect in public administration, as noted by ?.

Take, for instance, the rich historical study presented in ?. Centeno highlights how a long colonial (and post-independence) history of dependence on com-

³¹ ?.

³²This has been modelled extensively in American Politics, primarily through the lens of executive-legislative bargaining. See ?.

³³?, ?, ?.

mercial relations with external markets, through commodity-based exports, provided weak incentives for Latin American states to penetrate their territory and tax their own citizens. Contra Tilly, Latin American states waged the “wrong” kind of war, civil wars that depleted reserves while failing to provide incentives for the consolidation of state institutions, since these were too weak to effectively mobilize resources in a total war in the first place.³⁴ Weak domestic fiscal bases and limited penetration of their domestic territories left most of Latin America populated by weak states.

Another body of scholarly work focuses on factor endowments shaping the developmental path of state institutions in Latin America. In their study, ? highlight how Latin American colonies, characterized by favorable conditions for plantation systems, produced highly unequal societies that locked in institutional arrangements that reproduced inequality in human capital, political power and inhibited economic development. In a similar vein, ? argue that high settler mortality discouraged investments in political institutions, in particular property rights to protect citizens from expropriation. Once set in place, these institutions were reproduced over time and explain different developmental paths.

My conceptual framework reinterprets path-dependence. On the one hand, institutional change is a clearly a costly endeavor. Changing inherited institutions requires confronting actors who may benefit from their reproduction.³⁵ However, rather than assuming that institutional reproduction will simply occur, I model and identify the conditions under which agents decide to modify institutional arrangements or not.³⁶ Change is quotidian. To identify it, we must map what is time-varying and time-invariant, the actors which remain in power and the ones which replace them, shedding light on the vicissitudes of political life in a systematic and sequential manner.

To identify these gradual movements, it is necessary to be empirically precise about the object of inquiry. A lack of conceptual and empirical clarity means that broad claims about the “extractive” nature or “unequal” concentration of political power remain aphorisms, without a substantive measure to detect variance or absence thereof.³⁷ Actors need to be well-defined as well. I link mayors and local legislators to the evolution of public services such as education and healthcare, while shedding light on the bureaucratic person-

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³⁶For an excellent review, see ?.

³⁷? stress the need for empirical measures of institutional strength.

nel responsible for bringing these to life. These interlinked actors and their strategic decisions form the basis of my argument.

Understanding and identifying change in state capacity requires defining the scope of analysis for this dissertation. I focus on a particular set of links in the causal chain: the bureaucratic personnel responsible for providing public services. Concretely, I focus on the municipal provision of education as the primary service which local bureaucrats, ranging from cabinet members, general managers, to frontline teachers and nurses are responsible for delivering in their every workday.

This is not a story of public administration alone. I build a theory of political action shaping bureaucratic personnel. While informally taking into account executive decisions to modify bureaucratic institutions, previous accounts rarely explore the full range and drivers of these decisions. In particular, seldom do we find an explicit treatment of the costs and benefits involved in the decision to invest in state capacity, what Geddes (1994) so aptly names the politician's dilemma. I focus on the electoral payoffs of public service provision: do incumbent mayors benefit from improvements in public service delivery? How does personnel management improve or undermine public services?

Leaders do not govern alone. For every elected mayor in Brazil, a set of legislators also take office. This diverse group of political actors interact strategically, and much of the executive-legislative bargain revolves around valuable buckets of jobs associated with cabinet positions, branches of government and municipal programs. A rich literature has emerged exploring the executive-legislative bargain, particularly in the U.S. context, but their application to the developing world context has been more limited.³⁸ There is much to be gained in translation.

2.4 The argument: a political administration of public services

This section started with a call for a conceptual change: embrace the political calculus embedded in administration and model it explicitly. In other words, move away from the ideal-type of a Weberian, autonomous bureaucracy and focus theoretically and empirically on political administration.³⁹ Where does

³⁸?, ?, and for an overview, ?.

³⁹?

that leave us concretely? In this section, I present the conceptual building blocks of my argument. As premised, I focus on the decision-making process by political actors in reshaping the bureaucracy. Key among them are mayors, who hold discretion over whom to fire and recruit into the local administration, and city councillors, who exercise power over budgetary approval.

Understanding political decisions necessarily implies taking into account their consequences, in terms of costs and benefits. Agents in my theoretical model are forward-looking, and their payoff is structured sequentially. Here is an example to build intuition. A mayor is elected into office, and hopes to be reelected. In her first year of mandate, she decides how to restructure her educational staff. If the mayor eliminates experienced, educated school staff in exchange for political loyalists with limited experience, the quality of educational services will fall. If voters are aware of and care about educational services, conditional on a decrease in the quality of public services, the chances of the mayor being reelected decreases.

Moreover, mayors do not govern alone. A legislative opposition at the local city council has an interest in removing the executive leader from office. In Brazil, the local legislature has to approve the budget in order to fund public services. This game structure is conducive to a bargaining dynamic where legislators extract valuable public sector jobs to reward loyalists, in exchange for favorable votes for budgetary approval. Mayors have to engage in coalition building through the offer of valuable public sector jobs, in order to coopt enough legislative votes.

The simple example above illuminates the main actors and payoff structure in my theoretical argument. Concretely:

1. A mayor is elected into office and seeks reelection.
2. Voters (potentially) observe and care about the quality of public services, rewarding good performance.
3. Legislators in the city council seek to maximize their share of public sector jobs.

My theory builds on an extensive literature in the electoral accountability literature, modeling public goods provision as an electoral game played between voters who want to induce good behavior and political incumbents bidding for reelection. Expanding on seminal models by ? and ?, political economists have explored theories incorporating electoral accountability as an incentive for shaping the behavior of elected officials. The crux of the argument relies on the desire for reelection, which motivates politicians to put effort into

providing voters to reelect them.⁴⁰

To summarize, a new mayor is elected into office and has the power to restructure the local bureaucracy. To be reelected, she has to convince the electorate that she will provide high quality public services in her second term, and to do so wants to minimize bureaucratic turnover. However, she must also coopt the legislature to approve the local budget by divvying up a share of the bureaucratic pie for patronage.⁴¹ The model highlights the tradeoff executive politicians face between investing in state capacity and garnering legislative votes.

Instead of assuming that politicians can set the quality of public goods provision, I model it as the probabilistic outcome of an investment in bureaucratic quality and legislative support. Producing better public goods requires an experienced and professional bureaucracy and legislative support. Reshuffling the bureaucracy is costly due to the loss of professional expertise accumulated by the inherited staff, but this underlying capacity is meaningless if the legislature does not grant its approval. The executive does not always control the legislative chamber once in office, and have to coopt them into supporting their agenda.⁴²

The mayor's strategy centers around a key part of her political resources: a set of public sector jobs is available to the executive for redistribution. These are a valuable resource for cooptation.⁴³ However, when doing so executive leaders face a dilemma. The mayor can invest in state capacity, retaining expertise and reaping benefits from better public service provision. However, doing so raises the possibility of retaliation by the opposition, who can threaten to oppose budgetary approval. This is the executive's dilemma.⁴⁴

⁴⁰? and ? incorporate voters updating Bayesian beliefs about politician types, a feature applied in my model.

⁴¹This aligns closely to previous studies on the use of ministerial positions to gain support from opposition members at the federal level. See ?, ?, ?.

⁴²Analogous to the concept of minority presidents in the literature on coalitional presidentialism. See ?.

⁴³Mayors enjoy full discretion into how to appoint workers into the public sector and often resort to distributing these jobs to appease members of the legislative.

⁴⁴?,

Chapter 3

Motivation

In Brazil, and increasingly across the developing world, public services are under the political administration of elected officials. In this section, I present a theoretical model that integrates the calculus of these principals regarding how to manage bureaucracies that deliver public services, mapping out the consequences of these decisions to their political survival and voter welfare. It is a sequential game, in which newly-elected mayors assess the electoral benefits of improving public services while taking into account the political arena they must coopt to get the budget approved.

The starting point of the game is the entry of a newly elected mayor into office.¹ In assuming her new role as the executive leader and manager of the local bureaucracy, the mayor knows that government is not an isolated affair. The political turnover in the executive is accompanied by renewal in the local legislature (*câmara de vereadores*). Some of these city councillors have declared themselves allies in the electoral campaign, composing what is broadly referred to as the government (*governo*) bench in the legislature. The remaining councillors are either independent or part of the opposition.

As noted by ?, and through my qualitative interviews in municipalities of Brazil, a key feature of local politics is the executive-legislative bargaining over public sector jobs. City councillors actively seek to place loyalists within the bureaucracy, while mayors themselves are more hesitant to do so. This is due to a differential accountability between the two actors: while city councillors cater to small constituencies

¹For clarity, I denote the mayor with a female pronoun, the legislative opposition in plural and the voter with a male pronoun.

3.1 Institutional environment

In Brazil, local governments are composed of two branches. One is the executive, headed by the mayor who is elected through a first past the post system. The other, the local legislature, composed of city councillors elected through an open-list proportional representation system. The existence of these two types of political actors, elected through a different set of institutional rules, introduces in itself a divergent set of interests in the political arena. In particular,

3.2 Structure of the game:

In this section, I outline the action space, payoff structure and timing of the game. There are three actors: a mayor m , a legislative opposition o and representative median voter v . The goal of the executive is to be reelected into office.² The opposition can either approve the The voter derives utility from public goods, which is produced by the municipal bureaucracy.

To make analysis tractable and concise, I introduce a set of simplifying assumptions. First, I assume that the voter is sincere, meaning that he only considers his utility when deciding whether to reelect the incumbent. This excludes pivotality concerns and strategic voting from his choice set. Mayors are one of two types: a competent politician who effectively delivers high quality public goods, and an average one, who fails to always hit the mark. Note that this is an informational heuristic. I do not claim there are infallibly competent politicians. The intuition is that voters have beliefs about how competent a politician is (and strictly prefer those), forming their opinions by observing the quality of public goods they observe.

The game is played in two periods. Voter v does not observe the amount of patronage handed out by mayor m nor her type, but observes and derives utility from the realization of public good quality ω_t . A central feature in this model is uncertainty in translating bureaucratic quality θ at time t to public goods provision ω , with high quality public services ω_h produced probabilistically as a function of s and θ . The parameter θ captures the inverse relation between patronage and state capacity.³ The share of seats held by the opposition,

²This is a standard assumption in electoral accountability models, see ?. For a comparative politics perspective, see ?.

³See ?.

s , also adversely affects the probability of high quality goods being provided through the exercise of veto power.

The optimal strategy for the voter is to fire politicians when he believes that the incumbent is not a competent type, after observing the quality of first period public good ω_1 . For the mayor, her strategy is pinned down by the share of patronage which maximizes expected utility from holding onto office, conditional on her type and expected benefits from reelection. Mayor m has to offer public sector jobs to coopt the opposition while ensuring that the voter is satisfied enough to reelect her. The executive's dilemma is how to reconcile the incentive for reelection and the pressure imposed by the opposition.

The timing of the game is:

- 1) Nature draws the politician's type.
- 2) Politician observes her type and invests in bureaucratic quality θ_1 .
- 3) Nature realizes public good $\omega_1(\theta_1)$.
- 4) Voter observes ω_1 and casts vote to retain or fire the incumbent.
- 5) If incumbent is retained, she sets θ_2 and nature draws $\omega_2(\theta_2)$. If incumbent is deposed, a challenger takes office, sets θ_2 and the game ends.

3.3 Bureaucratic quality, veto power, and public goods provision:

I model public goods quality as a random variable ω with two possible states $\omega \in \{\omega_l, \omega_h\}$, where $\omega_h > \omega_l$. The probability of a high quality public good ω_h is a function of θ , a parameter denoting the bureaucratic quality, and s , the share of seats held by the opposition. Following ?, to avoid conceptual stretching I separate state capacity from its output. In this theoretical framework, state capacity is measured by analyzing personnel composition.⁴ Additionally, the opposition can exercise veto power, which increases monotonically with their share of seats in the legislative. Formally:

$$\Pr(\omega = \omega_h) = \frac{1 - s\theta}{1 + e^{-(10\theta - 5)}}$$

The impact of patronage depends on the share of seats controlled by the opposition. When the opposition have no veto power, i.e. $s = 0$, the executive

⁴See ?, ?.

can costlessly improve the quality of the bureaucracy θ , keeping patronage at a minimum and maximizing the probability of high quality public goods. When the opposition controls a larger share of the legislative chamber, it can effectively block the mayor from enacting her policy agenda, unless given a large share of public sector jobs, thus decreasing θ . This is captured by the term $s\theta$ in the expression above.

3.4 The mayor:

The mayor's choice set is the bureaucratic quality parameter θ_t . As θ increases - the mayor allocates a smaller proportion of jobs for patronage - the legislative opposition decreases their support for the executive and threatens to exercise veto power. This reduces the likelihood of providing the necessary resources to provide public goods. Adapting ?, there are two types of mayors: competent and average. Competent politicians excel in delivering high quality public goods and are rewarded by voters with reelection. Politicians who fail to excel in such provision are average.

The probability of a politician being competent is common knowledge: $\xi \in [0, 1]$. Conversely, the probability of her being average is simply $1 - \xi$. Both types derive utility from public goods provision ω , where for simplicity $u(\omega_l) = 0$ and $u(\omega_h) = 1$. We do not model the decision of the competent mayor: she simply delivers high quality goods and is inevitably reelected. We focus on the interesting case of the normal politician.

$$\begin{aligned} Eu_m(\theta_t, s_1 | \lambda) &= \mathbf{E}(\omega_1) + \delta \Pr(\text{reelection}) [\psi + \mathbf{E}(\omega_2)] \\ &= \frac{1 - s_1 \theta_1}{1 + e^{-(10\theta_1 - 5)}} + \delta \Pr(\text{reelection}) \left[\psi + \frac{1 - s_2 \theta_2}{1 + e^{-(10\theta_2 - 5)}} \right] \end{aligned}$$

The expression above formalizes the mayor's dilemma. The probability of reelection decreases with the share of jobs allocated to the opposition, since it lowers the quality of the bureaucracy. but if the mayor fails to appease them through patronage, it is increasingly costly to "govern". While technocrats are immune to these political pressures, pragmatists ultimately cave in. The price of compromise in a democratic setting is a reduction in state capacity,

as executives are forced to allocate positions within the bureaucracy to garner support in the legislative.⁵

3.5 Solving the dilemma (compromise):

Mayors solve the game through backward induction. If the mayor is a technocrat, she simply and effectively delivers, and the voter consumes ω_h . The average politician myopically maximizes expected utility in the second period.

$$\begin{aligned}\frac{\partial Eu_m(\theta_1, \theta_2 | \lambda = 1, s_2)}{\partial \theta_2} &= 0 \\ \frac{\partial}{\partial \theta_2} \frac{1 - s_2 \theta_2}{1 + e^{-(10\theta_2 - 5)}} &= 0 \\ \frac{1}{e^{-(10\theta_2^* - 5)}} + 10\theta_2^* &= \frac{10}{s_2} - 1 \\ \theta_2^* &= \frac{1}{10s_1} \left[10 - s_2 - \mathbf{W} \left(e^{\frac{1}{s_2} - 6} \right) \right]\end{aligned}$$

The interpretation of this result is straightforward: increases in the legislative share of the opposition reduces incentives to invest in bureaucratic quality.⁶ We can visualize how the optimal bureaucratic quality in the second period changes as a function of s_2 by plotting changes in the probability of high quality public goods.

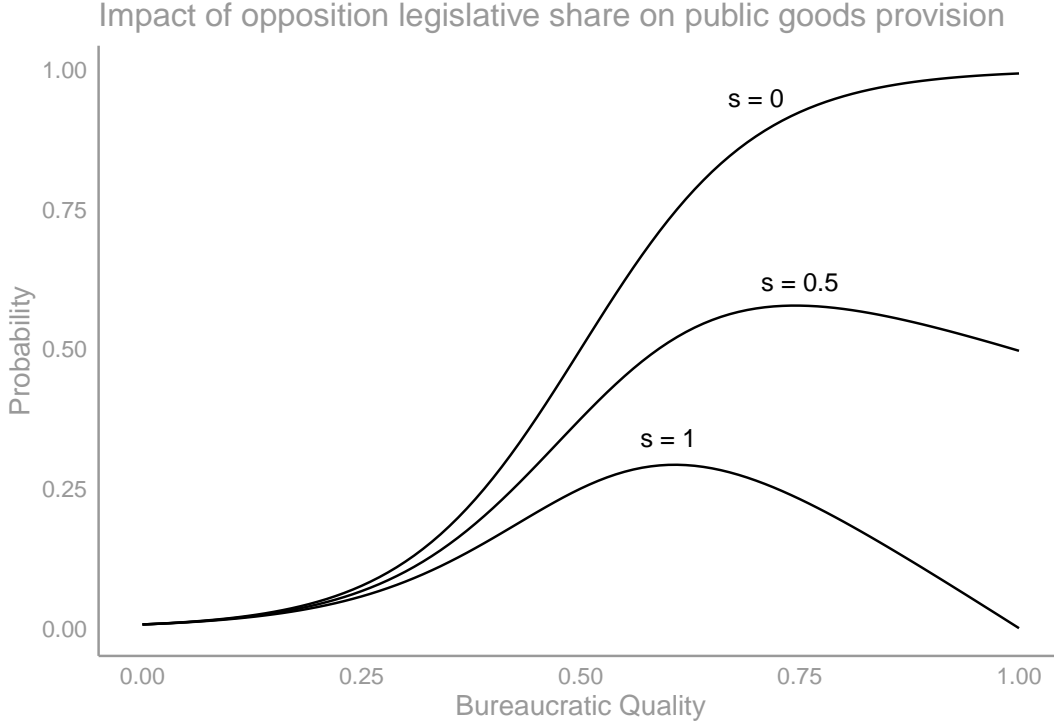
```
library(ggplot2)
fun_1 <- function(x){ (1-x)/(1+exp(-(10*x - 5)))}
fun_2 <- function(x){ (1-0.5*x)/(1+exp(-(10*x - 5)))}
fun_3 <- function(x){ (1)/(1+exp(-(10*x - 5)))}

ggplot(data.frame(x = c(0, 1)), aes(x)) +
  stat_function(
    fun = fun_1
  ) +
```

⁵For a discussion of patronage in Brazilian politics, see ?. For a historical perspective, ?.

⁶Note that for $s = 0$, this expression is undefined. Also, \mathbf{W} denotes the Lambert \mathbf{W} function.

```
stat_function(  
  fun = fun_2  
) +  
stat_function(  
  fun = fun_3  
) +  
annotate(  
  geom = "text",  
  x = 0.6,  
  y = 0.34,  
  label = "s = 1"  
) +  
annotate(  
  geom = "text",  
  x = 0.75,  
  y = 0.62,  
  label = "s = 0.5"  
) +  
annotate(  
  geom = "text",  
  x = 0.70,  
  y = 0.95,  
  label = "s = 0"  
) +  
xlab("Bureaucratic Quality") +  
ylab("Probability") +  
ggtitle(  
  "Impact of opposition legislative share on public goods provision"  
)
```



The quality of the bureaucracy θ_2 which maximizes the mayor's expected utility in the second period is strictly decreasing in s_2 , the share of seats controlled by the opposition. As the power of the opposition increases, its ability to veto and punish the mayor for withholding from patronage increases. The greater the threat of veto power, the more concessions politicians need to make in order to deliver high quality public goods ω_h . Conversely, when the mayor controls the legislative chamber, the benefits of bureaucratic quality are fully internalized and it is in turn maximized. We now turn to the electoral problem faced by the voters.

3.6 State capacity and democratic accountability:

Let v denote the median voter in the municipal electorate. Voters derive utility from the quality of public goods at time t , with a discount factor δ .

$$u_v(\omega_t) = \omega_1 + \delta\omega_2$$

Because voters cannot observe directly the type of the politician nor her hiring decisions, voters update beliefs about the politician's type after observing first period public goods output. If a voter observes a low public goods quality, he knows with certainty that the incumbent is incompetent, and therefore $\Pr(\text{competent}|\omega_{1l}) = 0$. Let $\mu(\omega_1)$ denote voter's belief that the politician is of a competent type after observing the first period realization of public goods.

$$\mu(\omega_h) = \Pr(\text{competent}|\omega_h) = \frac{\xi}{\xi + \Pr(\omega_1|s)(1 - \xi)} > \xi$$

Note that for any ω_h , the probability that the incumbent is competent is higher than the probability of a random challenger being so. As a result, whenever the voter observes a high quality output in the first period, the incumbent gets reelected. This simplifies our analysis. After observing the realization of public good quality ω_1 , he retains the incumbent if and only if $\omega_1 = \omega_h$, and fires her otherwise. The probability of re-election is simply the probability that public goods provided are of high quality. This is conditional on θ_1 , the amount of investment in state capacity in the first period and s_1 , the opposition share in the first period.⁷

3.7 Initial investments in state capacity:

We turn to the initial decision of the politician. The executive maximizes her expected utility with respect to first term hiring decisions, factoring in the optimal decision and payoff for the second period. To reiterate, the probability of reelection is simply the probability of high quality public goods provision in the first period. Taking the first order condition with respect to θ_1 :

$$\arg \max_{\theta_1} \frac{1 - s_1\theta_1}{1 + e^{-(10\theta_1 - 5)}} \left[1 + \delta \left(\psi + \frac{1 - s_2\theta_2^*}{1 + e^{-(10\theta_2^* - 5)}} \right) \right] = 0$$

The optimal amount of investment in state capacity in the first term is analogous to the myopic optimization in the second period, weighed by the expected

⁷Note that the quality of the second period bureaucracy is independent of that in the first period. This is a strong restriction that I will relax in future iterations of this project.

payoff of reelection. The intuition behind this result is straightforward. As politicians value the future term more, they will invest more in state capacity. This is captured by the parameter δ and ψ , the former being the discount factor and the latter, office benefits. However, in a clear illustration of the trade-off implied between investing in state capacity and resorting to patronage to ensure legislative support, the dominant effect is imposed by s_1 , the share of legislative seats held by the opposition in the first period. I proceed to test this model empirically in the next section, focusing on cabinet positions at the municipal level.

3.8 Introduction

Decentralizing reforms in Brazil have taken place since the democratic transition in 1988. One of the cornerstones of decentralization was delegating responsibility for public service provision to municipal governments. Today, public education of infants from 6 to 14 years of age in Brazil falls primarily under municipal jurisdiction.⁸ This transfer of responsibility was accompanied by the rapid expansion of a street-level bureaucracy and mid-level management, geared towards providing educational services to students.⁹ Understanding the characteristics of this bureaucratic network is the main objective of this chapter.

Who are these bureaucrats responsible for delivering public education in municipalities across Brazil? What role do they play in the administration of these services? What are their characteristics, from both a professional standpoint and in terms of quality of services delivered? Leveraging micro-level data and reports generated internally by the Brazilian government, I provide descriptive statistics of over 1 million municipal teachers and school principals spread across the country. I document changes over time, focusing on a set of covariates: work experience, education level, pupil teacher-ratio, among other key indicators of the structure of this educational bureaucracy.

Any story of bureaucracy is incomplete without the politics. As noted by ?, educational staff is not impervious to political processes. While not the primary focus of this chapter, I highlight supportive evidence that the management of educational services intersects with electoral cycles. Interviews collected during fieldwork in the state of Ceará in the summers of 2018 and

⁸?, ?.

⁹?

2019 lend support to the hypothesis that schools and educational staff are subject to intense turnover as a result of political administration. I test this more rigorously in the following chapter: turnover.

3.9 Who depends on public education?

One of the most concerning features of public education in Brazil is that primary education is almost exclusively dependant on municipal governments. Crucial, formative steps in the cognitive development of infants depend on the quality of formal instruction offered in schools, such as verbal and mathematical literacy. Where that pipeline is broken, school evasion and drop-out are unfortunately common, with often irreversible damage to the educational formation of these children.

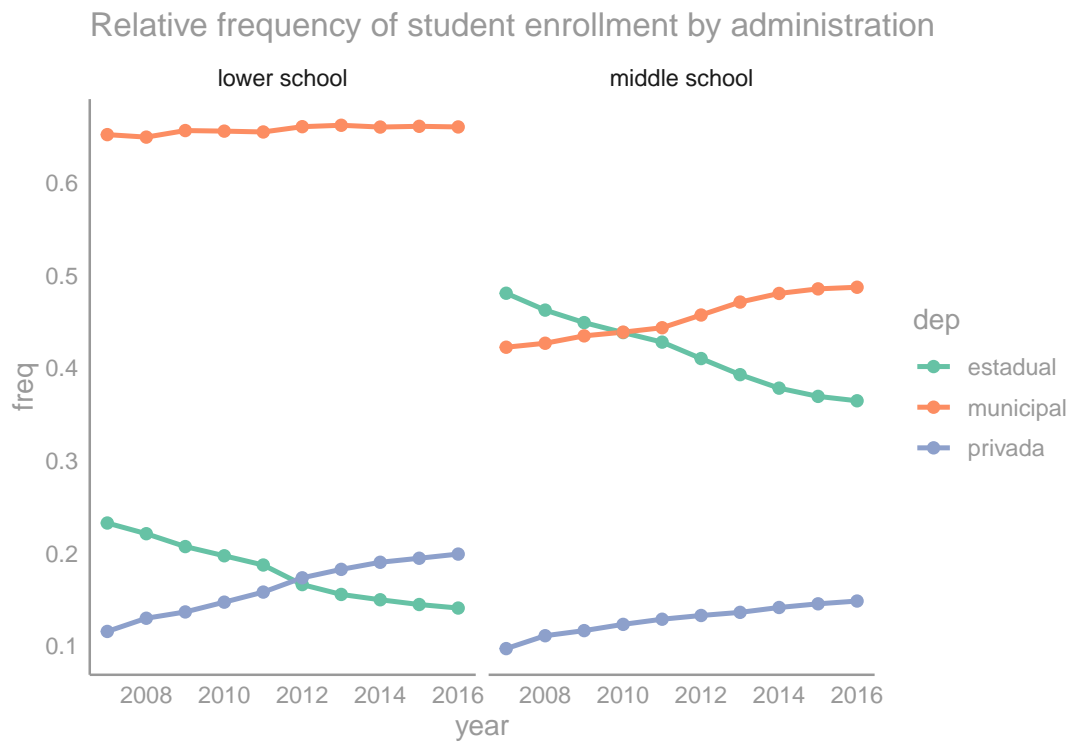
As noted before, decentralization has transferred responsibility for the education of students

```
class %>%  
  mutate(  
    stage = case_when(  
      between(grade_level, 1, 4) ~ "lower school",  
      between(grade_level, 5, 9) ~ "middle school",  
      T ~ NA_character_  
    )  
  ) %>%  
  filter(  
    !is.na(stage),  
    dep != "federal"  
  ) %>%  
  group_by(  
    stage,  
    year,  
    dep  
  ) %>%  
  summarise(  
    n = sum(num_enroll)  
  ) %>%  
  mutate(  
    freq = n/sum(n)
```

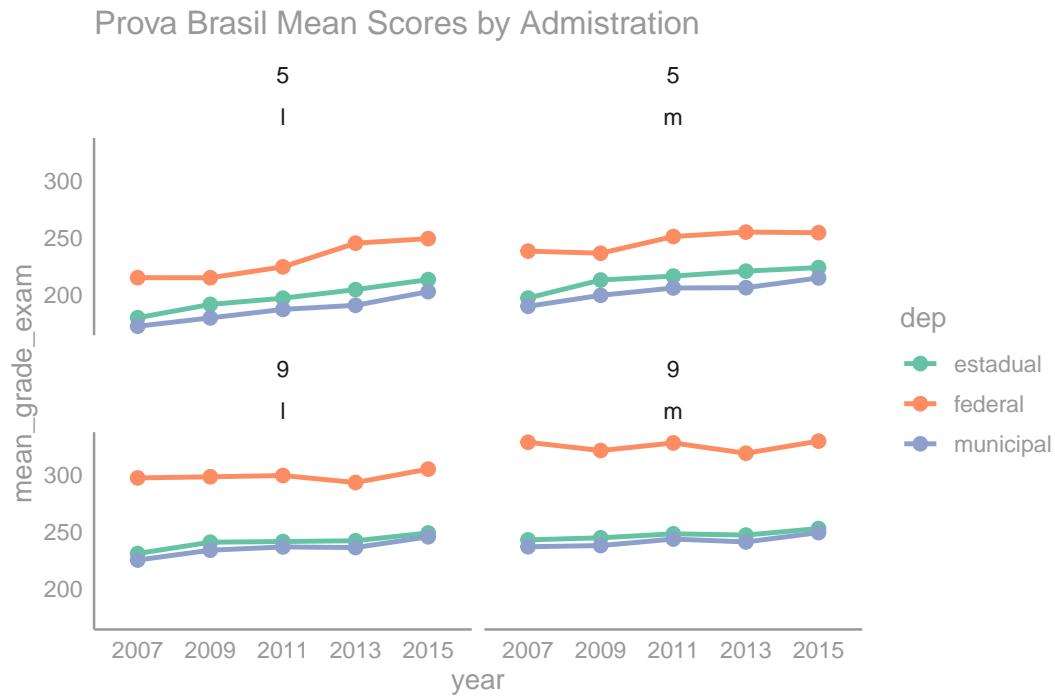
```

) %>%
ggplot(
  aes(
    year,
    freq,
    col = dep
  )
) +
geom_line() +
geom_point(
  size = 2
) +
facet_wrap(
  . ~ stage,
  nrow = 1
) +
ggtitle(
  "Relative frequency of student enrollment by administration"
)

```



```
saeb_dep %>%
  filter(
    dep != "",
    dep != "particular",
    year >= 2003
  ) %>%
  mutate(
    year = as.factor(year)
  ) %>%
  ggplot(
    aes(
      year, mean_grade_exam,
      group = dep, col = dep
    )
  ) +
  geom_line() +
  geom_point() +
  ggtitle(
    "Prova Brasil Mean Scores by Administration"
  ) +
  labs(
    caption = "Average test scores, by administrative level. Includes math and Por
  ) +
  facet_wrap(
    grade ~ subject
  )
```

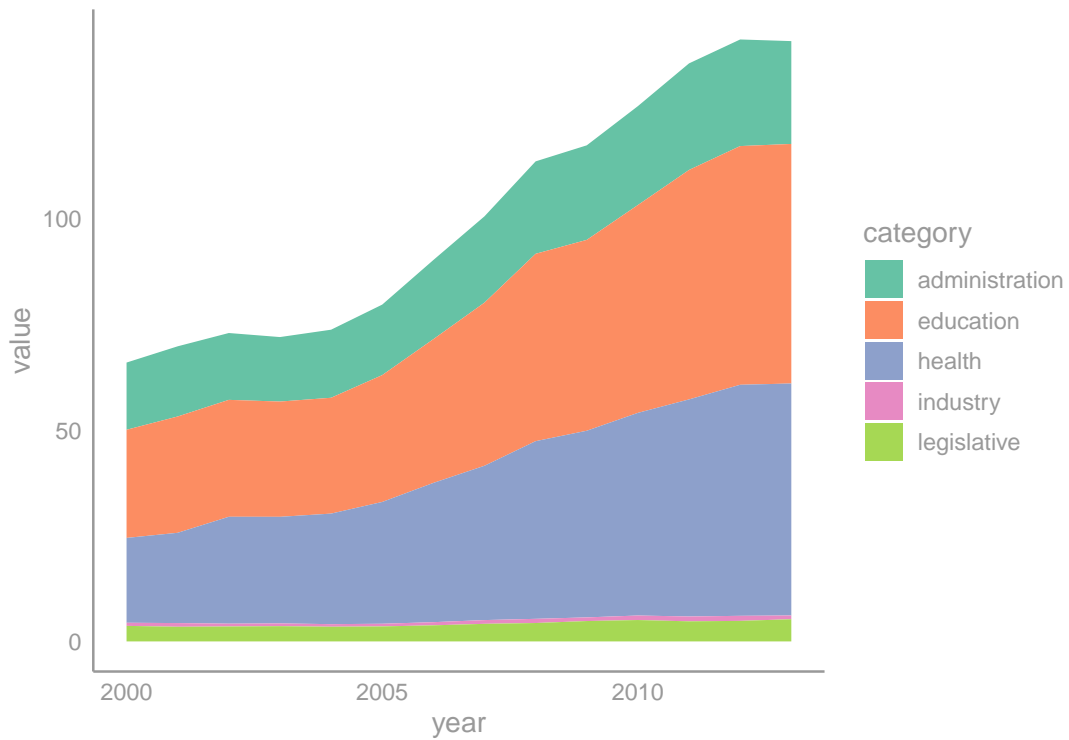
average test scores, by administrative level. Includes math and Portuguese test scores.

```
finbra %>%
  gather(
    -cod_ibge_6, -year,
    key = category,
    value = value
  ) %>%
  group_by(
    year,
    category
  ) %>%
  summarise(
    value = sum(value)/1e9
  ) %>%
  filter(
    category != "budget_total"
  ) %>%
  mutate(
    category = str_remove(category, "budget_")
  ) %>%
  ggplot(
```

```

aes(
  year,
  value,
  fill = category
)
) +
geom_area()

```

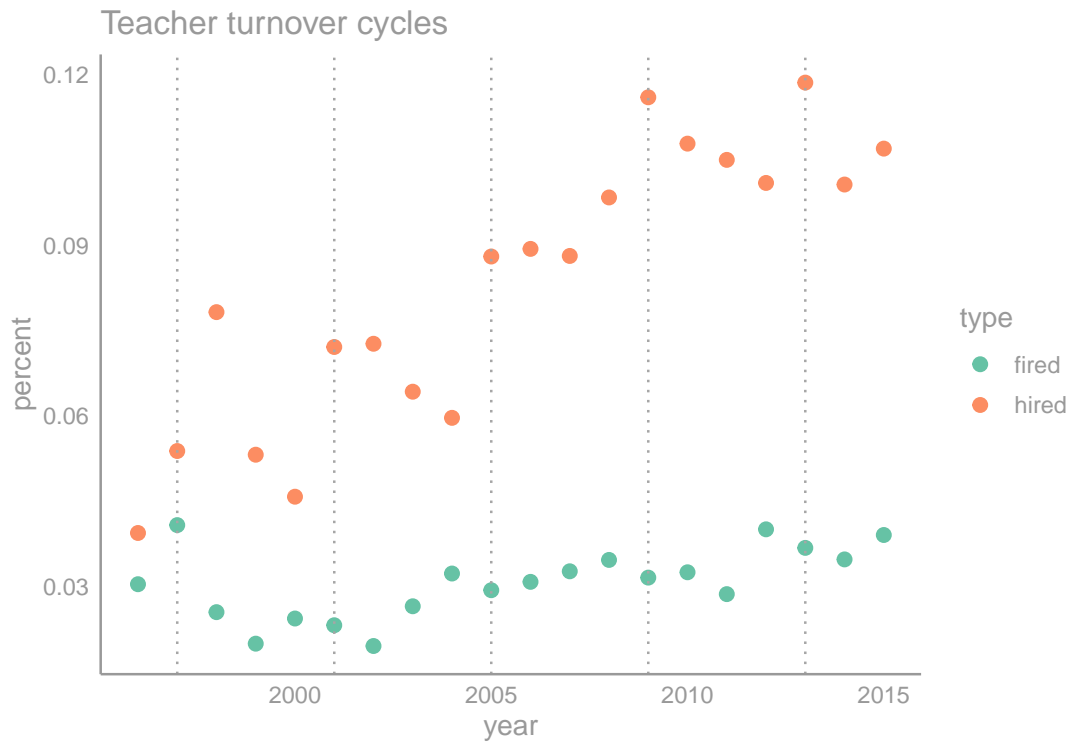


```

rais_mun %>%
  filter(
    str_detect(cbo_category, "education"),
    year >= 1996
  ) %>%
  group_by(
    year,
    cbo_category
  ) %>%
  summarise(
    hired = sum(mean_hired*total)/sum(total),
    fired = sum(mean_fired*total)/sum(total)
  )

```

```
) %>%  
gather(  
  "type",  
  "percent",  
  -year,  
  -cbo_category  
) %>%  
ungroup() %>%  
ggplot() +  
geom_point(  
  aes(  
    year,  
    percent,  
    col = type,  
    group = type  
  )  
) +  
mandate_year(  
  seq(1997, 2013, 4)  
) +  
ggtitle(  
  "Teacher turnover cycles"  
)
```



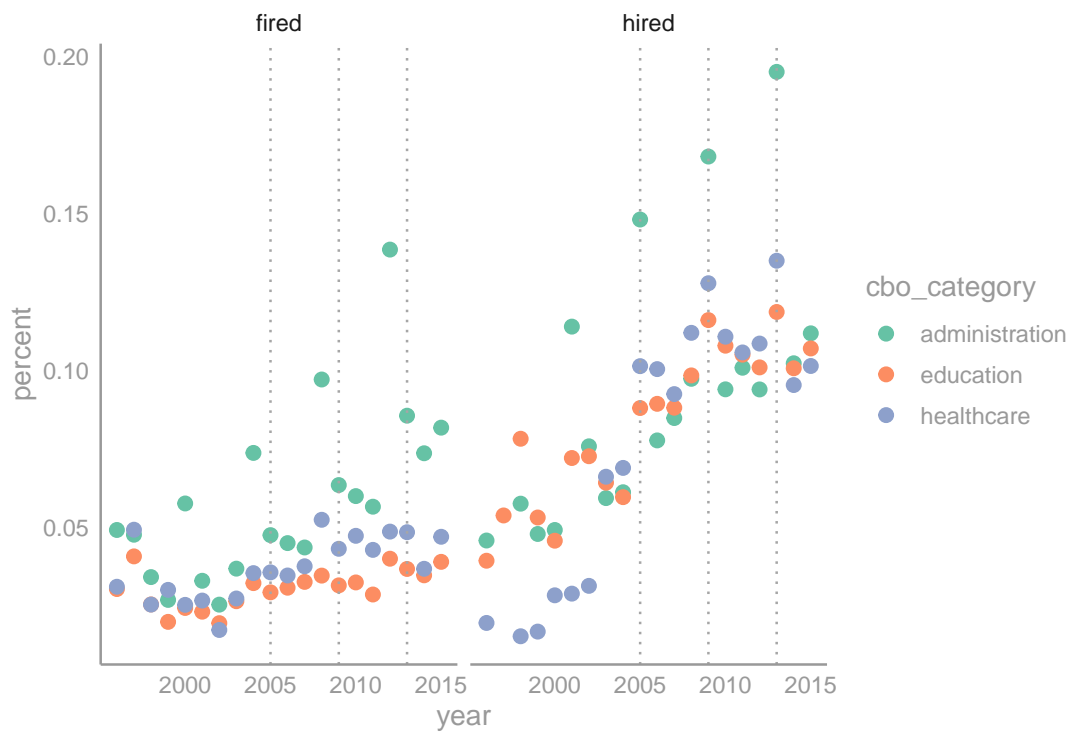
```
# extract top 5 categories
rais_mun %>%
  filter(
    cbo_category != "",
    !is.na(cbo_category),
    cbo_category %in% c("administration", "education", "healthcare"),
    year >= 1996
  ) %>%
  group_by(
    year,
    cbo_category
  ) %>%
  summarise(
    hired = sum(mean_hired*total)/sum(total),
    fired = sum(mean_fired*total)/sum(total)
  ) %>%
  gather(
    "type",
    "percent",
    -year,
```

```

    -cbo_category
  ) %>%
  ungroup() %>%
  ggplot() +
  geom_point(
    aes(
      year,
      percent,
      col = cbo_category,
      group = cbo_category
    )
  ) +
  mandate_year() +
  facet_wrap(
    type ~ .
  )

```

Warning: Removed 2 rows containing missing values (geom_point).

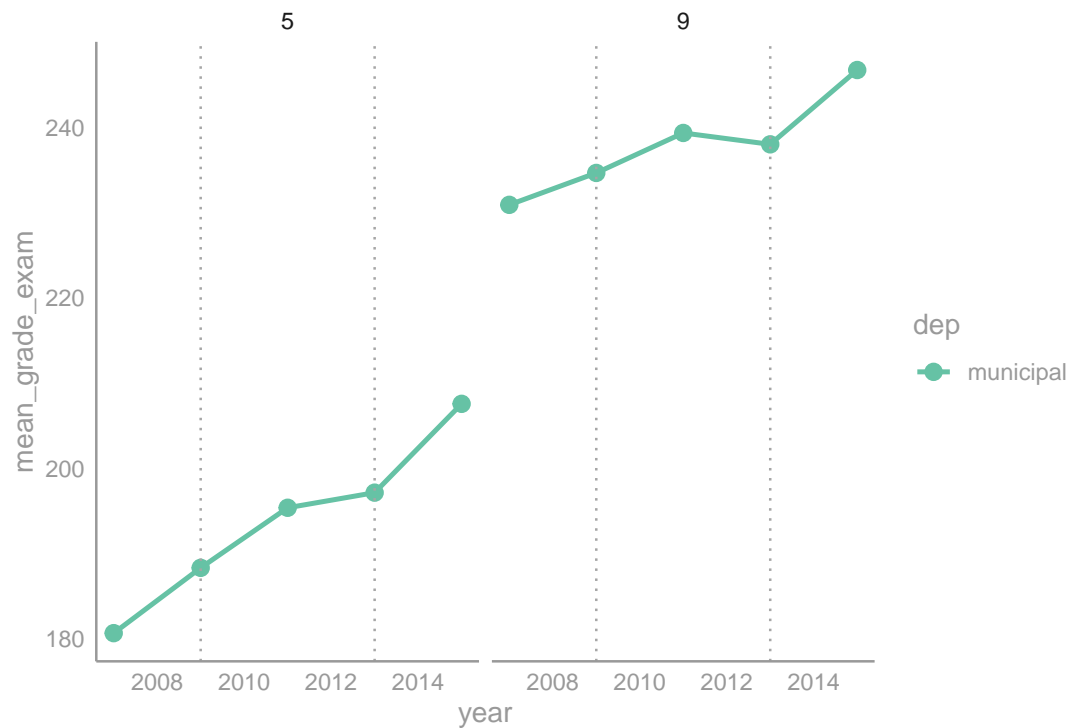


```
ggtitle(  
  "Bureaucratic turnover cycles"  
)  
  
## $title  
## [1] "Bureaucratic turnover cycles"  
##  
## attr(,"class")  
## [1] "labels"  
  
saeb_mun %>%  
  filter(  
    dep != "particular",  
    dep != ""  
  ) %>%  
  group_by(  
    year,  
    grade,  
    dep  
  ) %>%  
  summarise(  
    mean_grade_exam = weighted.mean(  
      mean_grade_exam,  
      attendees,  
      na.rm = T  
    )  
  ) %>%  
  ggplot(  
    aes(  
      year,  
      mean_grade_exam,  
      group = dep,  
      col = dep  
    )  
  ) +  
  geom_line() +  
  geom_point(  
    size = 3  
  ) +  
  facet_wrap(  
    ~ dep
```

```

grade ~ .
) +
mandate_year(
  years = seq(2009, 2013, 4)
)

```



The empirical analysis of bureaucrats responsible public service delivery is a novel contribution to extant literature on social policy in Latin America. Previous studies have conceptualized social policy primarily from the standpoint of both legislation and clientelistic redistribution.¹⁰ In order to understand access to public services, scholars have analyzed the implementation of progressive social policies to the rise of leftist parties or coalitions in the turn of the 21st century.¹¹ Others have criticized this focus on formal institutions, arguing that informal practices such as clientelism undermine the actual implementation of social policy, leading to perverse accountability in some cases.¹²

Beyond the formal and informal analysis of social policies, there is the problem

¹⁰?, ?.

¹¹?, ?.

¹²?, ?.

of bureaucratic implementation and that is the focus of this chapter.¹³ For each social policy, the final point of contact connecting the state to citizen is the bureaucrat delivering the relevant service.¹⁴ To focus my analysis, I build on extant literature on bureaucracies in Latin America and Brazil in particular.¹⁵

Studies on bureaucracies in Latin American countries have primarily narrowed in on technocratic upper echelons, the commanding heights of the state such as federal-level bureaucrats responsible for determining macroeconomic policy or technological innovation.¹⁶ Limited focus has been placed on the bureaucratic staff at the municipal level, and even less so at teachers or doctors responsible for delivering these services on the ground.¹⁷

Making precise the object of inquiry requires delving deeper into the structure of educational services in Brazil. This chapter provides an outline of the governmental structure of responsibility for education, as well as the degree of interaction between different levels of government. Moreover, I trace the educational system at the municipal level and myriad evolution paths across time from the standpoint of the personnel. I highlight the historical trends in the quality of educational staff, while also pinpointing the wide heterogeneities which persist. In doing so, I draw inspiration from ?, which documents the recent changes in social policy, citing significant improvements in educational outcomes. My focus is on the historical evolution of the municipal education system, from primarily a spatial and temporal perspective.

The chapter is divided into four sections. The first traces an institutional and organizational history of educational services in Brazil from the municipal level, focusing particularly on the consequences of decentralization on the growth of the educational bureaucracy. The second section focuses on personnel, describing the evolution of educational staff, shedding light on the professional characteristics of teachers and school principals from a nation-wide, municipal perspective. This contrasts with more anecdotal analyses of local educational systems, such as ?.¹⁸

The third section lays out the framework for linking educational staff to the electoral cycle. I describe how cycles of bureaucratic turnover align with the electoral calendar, raising concerns as to the degree of alignment between

¹³?

¹⁴?

¹⁵?, ?.

¹⁶?, ?, ?.

¹⁷?

¹⁸For an exception, see ?.

political interests over patronage and personnel management. Estimates of the relationship between is to be found in the executive decisions made by mayors who are elected into office since they have sole jurisdiction over educational policy. This research agenda will be the subject of the next iteration in this research project.

3.10 A changing educational landscape

In Brazil, the responsibility for primary education, in the formative years from 6 to 14, were historically the responsibility of states, not municipalities. Due to demographic changes, this student body has been declining across most of the regions in Brazil, with the exception of the Northeast. Accompanying these changes is the relocation of the majority of these students under the purveyal of municipal governments, responsible for administering educational services to this growing

In this analysis, I focus on the teachers responsible for primary education, the equivalent to kindergarten through eight grade in the United States. These are formative years, where students from 6 to 14 years old learn crucial skills such as counting, reading and writing. Since democratization in 1988, the new constitution enshrined primary education as the responsibility of municipal governments. Since then, Brazil's education system has rapidly expanded, with a massive growth in the number of municipal teachers. The dashed lines denote municipal election years.

There has been widespread debate on the potential for patronage by local politicians.¹⁹ It is important, however, not to assume that patronage is the only mode of hiring at the local level.²⁰ To assess whether or not these new teachers are being hired meritocratically or through patronage, we must know who they are. A major contribution of our empirical analysis is leveraging the fine-grained data of the RAIS (Annual Report of Social Information), a micro-level data set collected annually by the Ministry of Labor. We go beyond raw numbers to illuminating teachers' characteristics.²¹

¹⁹See ?, ?, and ?.

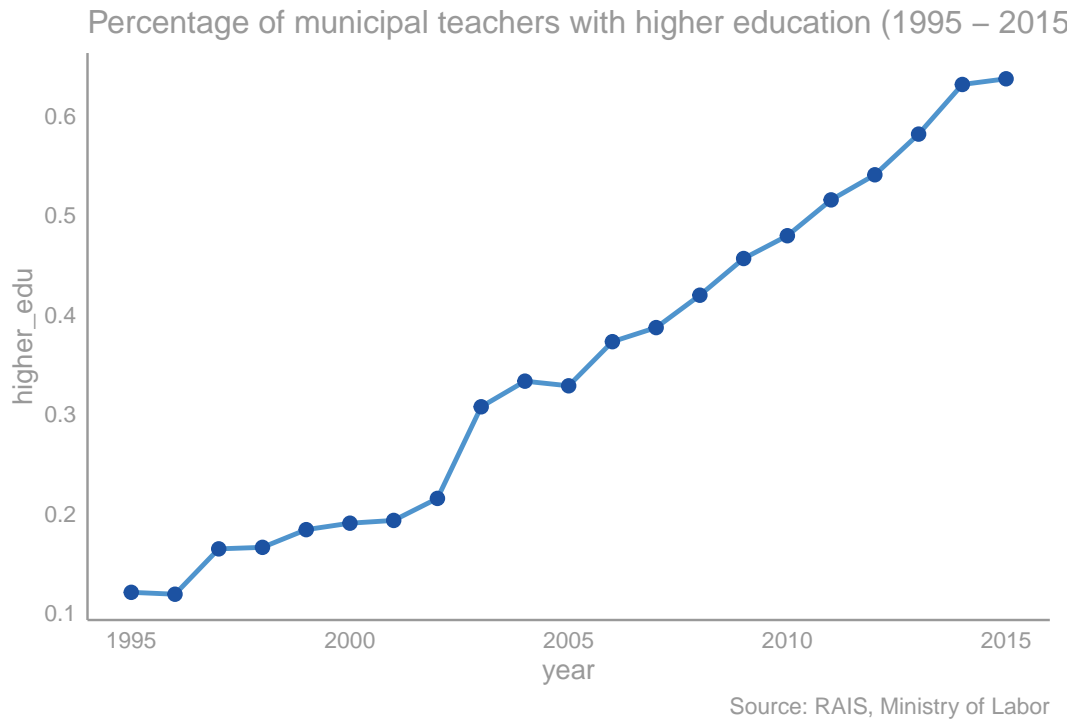
²⁰?, ?, ?.

²¹?

3.10.1 Who becomes a teacher?

This section sheds light on who decides to become a teacher in municipalities across Brazil. Teachers tend to be relatively older professionals, with a historically weak educational background. This trend, however, has been shifting over time. While in 1985, only 15 percent had a higher education degree, in 2015 over 60 percent had at least completed university. Figure 2 illustrates this shift across different sectors.

```
rais_edu %>%  
  filter(  
    year >= 1995  
  ) %>%  
  group_by(  
    year  
  ) %>%  
  summarise(  
    higher_edu = mean(  
      rais_edu >= 9,  
      na.rm = T  
    )  
  ) %>%  
  ggplot(  
    aes(  
      year,  
      higher_edu  
    )  
  ) +  
  geom_line() +  
  geom_point() +  
  labs(  
    caption = "Source: RAIS, Ministry of Labor"  
  ) +  
  ggtitle(  
    "Percentage of municipal teachers with higher education (1995 - 2015)"  
  )
```



In fact, it is important to note that despite pessimistic evaluations of the quality of education in Brazil, there has been significant improvements occurring throughout the years. While the public sector lags behind the private in terms of educational background of its teaching personnel, there has been significant improvements over time. More than half of its staff hold higher education degrees.

These improvements have been accompanied by better compensation for public teachers. While in the early 1990's, private teachers received higher wages than their public counterparts, this changed by the 2000's. Currently, the median wage for a public sector teacher stands at around 970 reais (270 US dollars), far more than the median private teacher wage, 575 reais (160 US dollars).

```
rais_edu %>%
  filter(
    year >= 1995
  ) %>%
  group_by(
    year
  ) %>%
  summarise(
```

```
wage = median(
  rais_wage,
  na.rm = T
)
) %>%
ggplot(
  aes(
    year,
    wage
  )
) +
geom_line() +
geom_point() +
labs(
  caption = "Source: RAIS, Ministry of Labor"
) +
ggtitle(
  "Median teacher wages (1995 - 2015)"
)
```



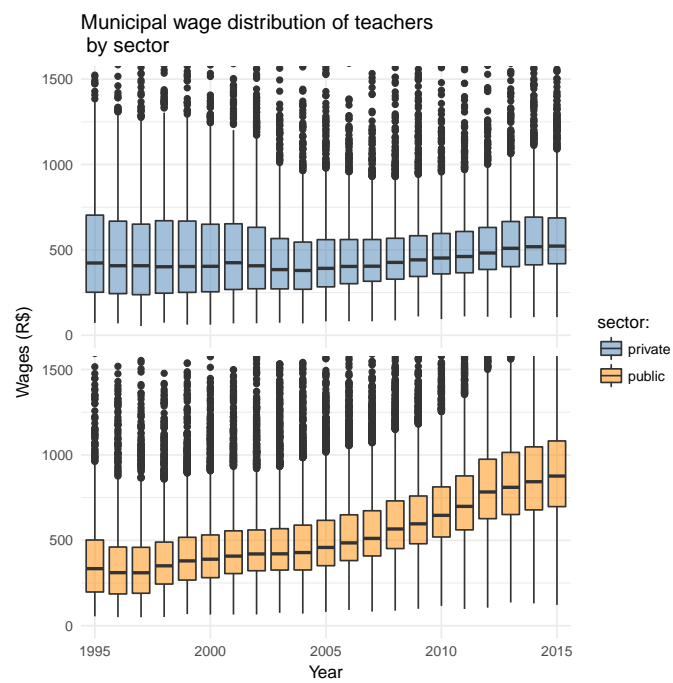
Figure 3: Teacher Wages (1995-2015)

Figure 3.1: *

Source: RAIS, Ministry of Labor

There has been a steady improvement in the overall professional experience of teachers. The median professional experience of the private sector has remained stable at around 2.5 years, while for the public sector it has increased to over 7 years in 2015. This confirms popular opinion of public sector teaching jobs as inherently more stable than their private counterparts.

```
rais_edu %>%
  filter(
    year >= 1995
  ) %>%
  group_by(
    year
  ) %>%
  summarise(
    wage = median(
      rais_wage,
      na.rm = T
    )
  ) %>%
  ggplot(
    aes(
      year,
      wage
    )
  ) +
  geom_line() +
  geom_point() +
  labs(
    caption = "Source: RAIS, Ministry of Labor"
  ) +
  ggtitle(
    "Median teacher wages (1995 - 2015)"
  )
```



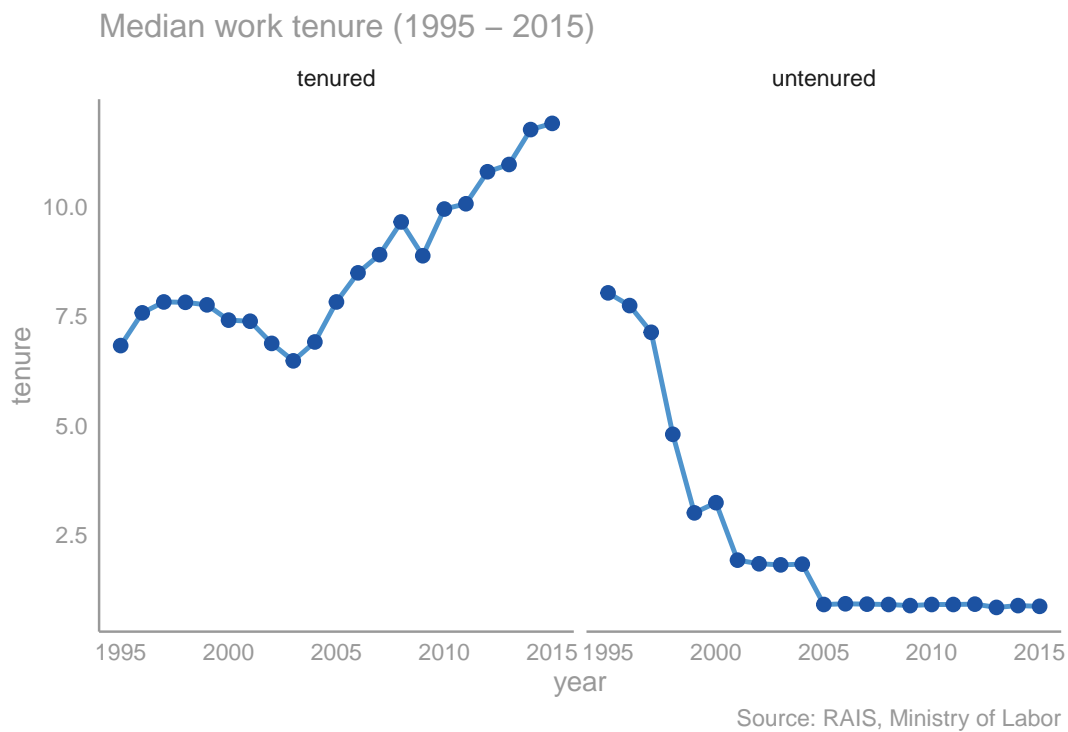
Source: RAIS, Ministry of Labor

```
rais_edu %>%  
  filter(  
    year >= 1995,  
    !is.na(rais_permanent)  
  ) %>%  
  mutate(  
    rais_permanent = if_else(  
      rais_permanent == 1,  
      "tenured", "untentured"  
    )  
  ) %>%  
  group_by(  
    year,  
    rais_permanent  
  ) %>%  
  summarise(  
    tenure = median(  
      rais_time,  
      na.rm = T  
    )  
  )
```

```

) %>%
ggplot(
  aes(
    year,
    tenure
  )
) +
geom_line() +
geom_point() +
labs(
  caption = "Source: RAIS, Ministry of Labor"
) +
facet_wrap(
  . ~ rais_permanent
) +
ggtitle(
  "Median work tenure (1995 - 2015)"
)

```



Finally, the proportion of teachers who are offered a permanent contract has

Figure 4: Teacher's work tenure (1985-2015)

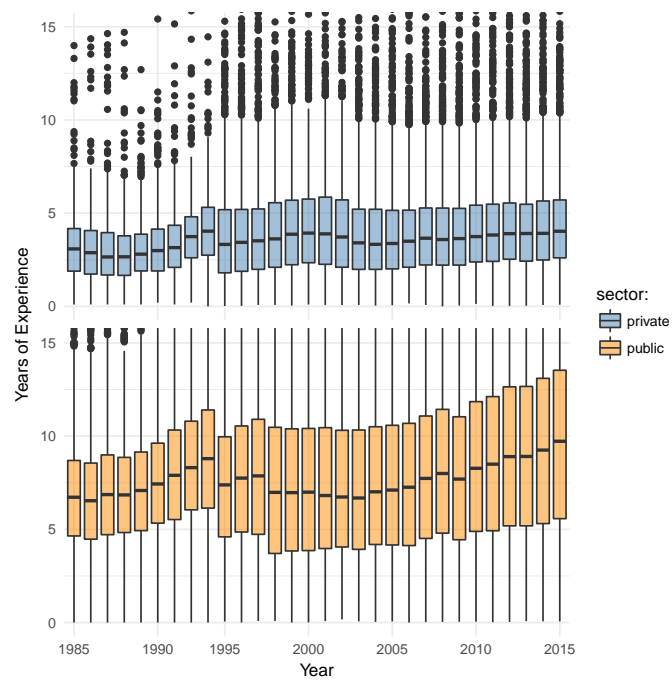


Figure 3.2: *

Source: RAIS, Ministry of Labor

decreased dramatically since 2002. There is also an increase in the turnover rate, a natural development given the lower job security offered by temporary contracts. Figures 5 and 6 illustrate these changes. This development raises concerns over the level of expertise which these teachers can develop given such high attrition through different administrations.²² Furthermore, social ties with the community are important, a process which naturally takes time and may be more difficult to accomplish when contracts are temporary.

```
rais_edu %>%
  filter(
    year >= 1995
  ) %>%
  group_by(
    year
  ) %>%
  summarise(
    hired = mean(rais_hired == 1, na.rm = T),
    fired = mean(rais_fired == 1, na.rm = T)
  ) %>%
  ungroup() %>%
  gather(
    "key",
    "value",
    -year
  ) %>%
  ggplot(
    aes(
      year,
      value,
      color = key
    )
  ) +
  geom_line() +
  geom_point() +
  mandate_year()
```

²²See ?, ?.

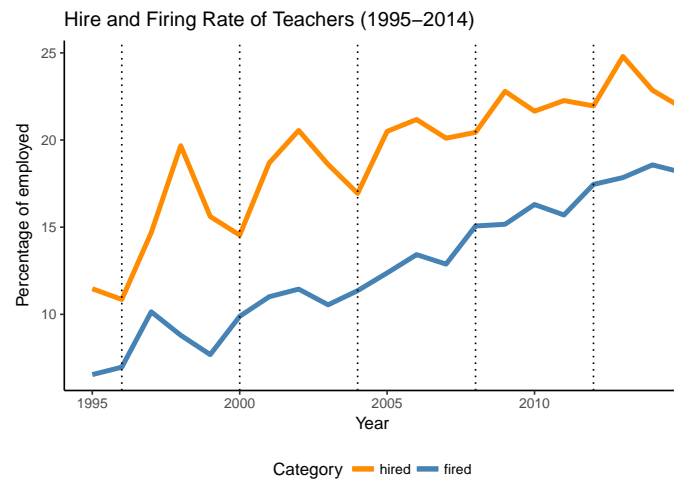
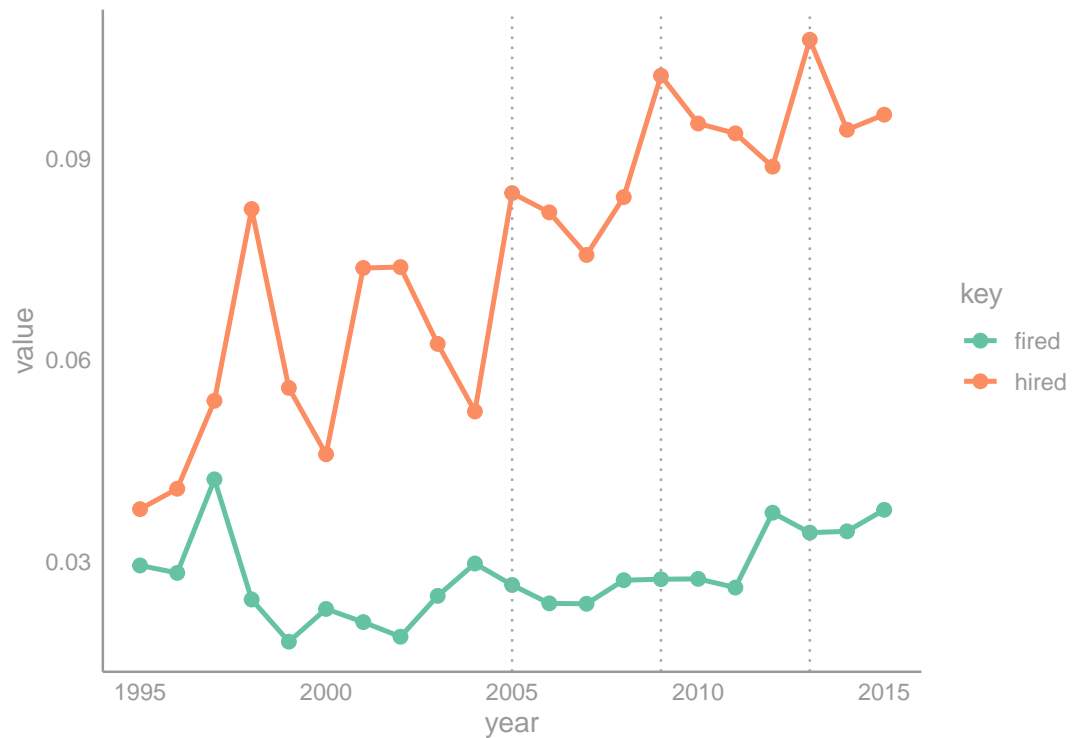
Figure 5: Turnover Rate of Teachers (1995-2015)

Figure 3.3: *

Source: RAIS, Ministry of Labor



There is extensive argument and criticism of the Brazilian bureaucracy as

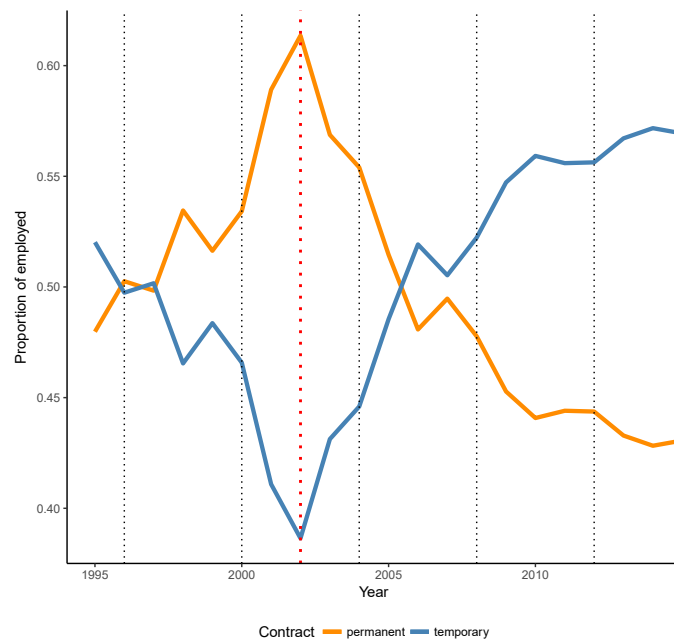
Figure 6: Share of Contracts by Type (1995-2015)

Figure 3.4: *

Source: RAIS, Ministry of Labor