The Impact of Office Proximity in Legislative Decision-Making: Evidence from Brazil

Felipe C. de Figueredo*

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Abstract

Spatial proximity within the congress is an important source of peer effects, as it influences the patterns of social interactions of legislators and their decision-making. I take advantage of a randomized office lottery in the Brazilian Chamber of Deputies to estimate the effects of spatial proximity on legislative decision-making. I find that office proximity increases agreement between neighboring legislators in contested votes; they show a significant 2 percentage points increase in voting convergence, about eight times the average effect observed across all voting decisions. Furthermore, the presence of experts, such as committee members, amplifies this effect to 4.5 p.p. in closely contested votes. These findings indicate that office proximity enhances other sources of influence in contested decisions, with its effects primarily driven by expertise. This aligns with cue-taking theories, suggesting that legislators rely on perceived experts – often standing committee members responsible for reporting the measure – to guide their voting behavior, particularly in closely contested scenarios.

1 Introduction

Economists are increasingly acknowledging the important role of social interactions in shaping individual behaviors and how individuals value decisions and their outcomes. There is evidence of this influence in many different domains, for example, education (Sacerdote, 2001; Zimmerman, 2003), labor markets (Zenou, 2008; Cingano and Rosolia, 2012), welfare programs (Duflo and Saez, 2003), crime (Glaeser et al., 1996), youth behavior (Case and Katz, 1991; Evans et al., 1992; Kawaguchi, 2004), and demand for housing quality (Patacchini and Venanzoni, 2014). Social interactions have also played an important role in the legislative system, as interactions and interpersonal relationships among legislators across different social structures can significantly influence legislative behavior and policy outcomes (Caldeira and Patterson, 1987; Fowler, 2006).

Spatial proximity within the congress represents an important underlying social structure, as it influences the patterns of social interactions of legislators and their decision-making. Closer spatial proximity, such as through seating arrangements and office locations, is associated with

*Ph.D. Candidate, University of Washington, email: fcdf@uw.edu

stronger social connections and influence (Ferber and Pugliese, 2000; Masket, 2008; Rogowski and Sinclair, 2012; Saia, 2018; Harmon et al., 2019; Darmofal et al., 2023; Alquézar-Yus and Amer-Mestre, 2024; Lowe and Jo, 2024). Past studies have not been able to clearly determine whether these relationships are causal, as in many settings legislators may endogenous choose to locate near certain peers. For example, legislators might choose to stay closer and communicate more frequently with those who are similar to themselves, such as in party affiliation[1]. As spatial proximity could be related with other associated attributes – for instance, similar views – it is not straightforward to identify their independent social effects. Thus, group endogeneity problems present a challenge for the identification of peer effects within this type of network.

This paper examines how spatial proximity influences legislative decision-making by taking advantage of the completely randomized allocation of legislative offices to first-term male legislators in the Chamber of Deputies of Brazil. I use this office lottery to establish causal links between office proximity and legislators' behavior, as the random assignment of office locations eliminates selection bias[2]. Brazil's proportional and open list electoral system, which often leads to majority coalition formation in the legislative, presents an intriguing environment for studying peer effects dynamics. In addition, most newly allocated offices are located in the same building, which consists of eight identical floors, each with a single hallway leading to a bank of elevators. This layout fosters spontaneous communication among legislators who frequently engage with their neighbors. For instance, former Worker's Party (PT) deputy, João Grandão, once reported that he frequently ran into his officemate and political adversary, who later became president, Jair Bolsonaro. He stated, "I always talked to him, (...) and I never had a problem with him"[3], highlighting that their interactions were frequent despite any political or ideological differences. In another, more ordinary situation, deputy Gonzaga Sobrinho mentioned that he borrowed a tie from his office neighbor, Deputy Silvio Costa[4]. These examples highlight the casual interactions that often take place in office neighborhoods.

To explore the impact of office proximity on legislative behavior, I analyze voting convergence for all possible legislator pairs per roll call. The sample is restricted to pairs in which at least one member was subject to the lottery. Pairs of incumbents are excluded because both members could have chosen their office neighborhood. To create these pairs, this study uses data from the 55th and 56th legislative sessions – covering the periods from 2015 to 2022. Spatial proximity is measured by an indicator of whether a given office is directly next to, in front of or diagonally across from any other office.

[1] As Krehbiel (1993) claims: "In casting apparently partisan votes, do individual legislators vote with fellow party members in spite of their disagreement about the policy in question, or do they vote with fellow party members because of their agreement about the policy question?"

[2] Other network effects, such as through friendship ties, also suffer from the same endogeneity problem. Cohen and Malloy (2014) and Battaglini et al. (2023a, 2023b) have used alumni network data to identify the impact of friendship on legislative decision-making

[3] https://www.topmidianews.com.br/na-lata/na-lata-vizinho-de-gabinete-de-bolsonaro-deputado-do-pt-lembra/67504/.

[4] In his speech on June 3, 2015, Deputy Gonzaga Sobrinho remarked: "As they said there wouldn't be a session today and that all the Deputies had traveled, I'm now seeing that many are here and there will indeed be a session. So, I had to borrow a jacket from the guard at the entrance and got the tie from Deputy Silvio Costa, my office neighbor."

The results show that, on average, office proximity increases vote convergence by 0.26 percentage points – this effect amounts to 8% of the influence of same party membership and is not statistically significant. Since most of the votes in the sample are cast on procedural issues, where there is little variation, as legislators usually stick to their party's position or their personal beliefs, it could be that these influences potentially mask the effects of spatial proximity on the convergence of votes within pairs of legislators. Thus, I run a heterogeneity analysis taking into account the importance of voting by emphasizing non-procedural decisions. In disputed votes where roll calls have narrow victory or defeat margins, there is strong evidence for direct influence from office-mates on voting agreement. Votes for highly contested roll calls, with a margin of less than 5 p.p., show a statistically significant estimate of 2 percentage points – roughly eight times the magnitude of "comfortable" votes. Although smaller in magnitude, the effects of spatial proximity remain robust with larger result margins (10 p.p. and 25 p.p.) and with an alternative measure of voting convergence. The results do not hold under virtual vote systems but remain robust when tested using randomization inference.

This study also explores the relationship between office proximity and expertise in disputed decisions. I show evidence that pairs with neighboring legislators that are experts present higher voting convergence in contested votes. An expert (or perceived expert) is defined as a member of the committee related to the subject of the proposal being voted. The point estimate is 4.51 percentage points for roll calls with a result margin of less than 5 p.p. – and remain significant with a result margin of less than 10 p.p. and with randomization inference. This finding suggests that when confronted with the necessity of making a decision on a disputed legislation, legislators can look to individuals in closer proximity and who are perceived to be experts. Usually these are members of the standing committee that reported the measure to the floor. Legislators coped with uncertainty about the consequences of voting one way or the other by using the voting intentions of trusted, expert colleagues to decide how to vote (Uslane and Werger, 1977). These findings also suggest a potential mechanism of cue-taking where legislators rely on perceived experts—typically standing committee members who reported the measure – to guide their voting decisions, especially when informed decision-making is crucial, though other mechanisms, like social pressure, cannot be ignored (Lowe and Jo, 2024). A work close to mine is Fong (2018), who exploits a natural experiment wherein legislators are assigned to committees midsession because of the death, resignation, or transfer of the seat's previous occupant. He analyses co-sponsorship networks and finds that peers who are close to the legislator in the legislative network tend to vote more often with that legislator on bills from the legislator's new committee's jurisdiction after the assignment than they did before.

I also run heterogeneity analyses based on shared social characteristics, vote topics, and proposition types to explore how these factors influence the outcomes. I show that pairs sharing the same freshman status and the same party both look statistically significant, whereas same state of origin only looks marginally distinguishable from zero. The effects of proximity are stronger on topics related to labor and social security. Furthermore, heterogeneity analysis by proposition type shows that votes on Provisional Measures – executive decrees with immediate

legal force pending legislative approval – exhibit stronger agreement among closely located legislators. However, the point estimate is not statistically significant as is the other point estimate for the remaining types of proposition. It, therefore, reveals that type of proposition does not represent an important dimension of heterogeneity in the analysis of the influence of spatial proximity on co-voting patterns.

I also implement a number of robustness checks. Firstly, I use different definitions of office neighborhood and voting convergence, showing that the choices made do not impact the main results and their interpretation. Secondly, it explores alternative definitions of the importance of voting beyond their result margin. Taking in consideration the relevance of the individual vote for each legislator, it adapts the Battaglini et al. (2023a) approach, in which roll calls are classified as relevant or not based on the salience of the topic being voted on by each legislator. This approach utilizes co-sponsorship data to determine the frequency with which each legislator has supported each topic, considering the least frequent topic as not relevant. The results only offer weak evidence that office proximity is more likely to increase agreement when the vote is not relevant for either both or only one legislator in a pair. This evidence weakly indicates that cue-taking might occur through office proximity in votes that are not part of the own legislator's agenda, situations in which they tend to be less informed about the legislation being voted.

A second approach to classifying votes according to their relevance follows Saia (2018), which categorizes roll calls based on the intensity of debate. Using speech data, it calculates the average daily number of speeches to establish a threshold, classifying roll calls as non-relevant if they do not exceed this threshold. TThis approach finds that roll calls classified as relevant and voted on during days of higher debate intensity are more likely to align among legislators in closer office proximity. Days with heightened debate intensity imply that legislators are likely to be more present in the Chamber as well as in their offices, potentially increasing the likelihood of communication among them. Thirdly, I analyze virtual votes cast under the *Sistema de Deliberação Remota* (SDR)[5] and show, on average, a negative and not statistically significant point estimate for voting convergence associated with sharing a similar location. For contested votes, with a result margin lower than 5 p.p., the impact of office proximity is 10 times smaller and no longer statistically significant. The effect of committee membership interacted with similar location also changes and is no longer statistically significant. Both findings support our hypothesis on the importance of physical interactions in explaining the influence of spatial proximity, also underscore the importance of keeping the standing committees operational.

This paper offers empirical evidence that adds to the existing literature on the influence of spatial proximity on legislative behavior (Ferber and Pugliese, 2000; Masket, 2008; Rogowski

[5]Due to social distancing measures introduced to combat the COVID-19 pandemic, the Chamber of Deputies (56th legislature) implemented the SDR, *Sistema de Deliberação Remota*, transitioning all plenary activities—including roll calls—to a remote format and temporarily suspending the functions of permanent committees. This completely remote setup lasted from March 17, 2020 until February 11, 2021, when a hybrid model was introduced, allowing legislators to return to in-person plenary sessions and resuming standing committee activities. This hybrid system remained in place until October 25, 2021, when normal operations resumed. Briefly in 2022, from the start of the legislative year in February until April 18, the Chamber reinstated the SDR. The period under the SDR allows me to perform a counterfactual exercise.

and Sinclair, 2012; Saia, 2018; Harmon et al., 2019; Darmofal et al., 2023; Alquézar-Yus and Amer-Mestre, 2024; Lowe and Jo, 2024), suggesting that office proximity serves as a social structure that influences non-procedural decisions and complements both ideological and non-ideological factors (Zucco Jr. and Lauderdale, 2011). By demonstrating that office proximity affects voting behavior even amid strong party and coalition influences, it advances as well our understanding of legislative dynamics. I also contribute to the informational theory of legislative committees by offering empirical evidence on their importance in the diffusion of information. In their model of strategic communication applied to the legislative context, Gilligan and Krehbiel (1989) demonstrate the informational rationale for committee power. They show that informational gains to the parent chamber are maximized when committee medians are near floor medians. Pereira and Mueller (2004) adapt this model to the Brazilian Congress and show the committees that are more representative of the floor that would have a greater effect of reducing uncertainty in equilibrium. On the other hand, if all the cue-givers in a policy domain tend to be a biased sample of the congress, the probability of unrepresentative policy decisions is very substantial. Therefore, this work contributes to the discussion by introducing a new transmission mechanism, spatial proximity, highlighting how legislative networks and expertise interact to influence policy outcomes.

Section II reviews the literature. Section III presents the institutional background of this study. Section III introduces the data and the empirical strategy. Section IV presents the peer-effects analysis on legislative behavior and its robustness checks. Section V concludes.

2 Literature Review

2.1 Spatial Proximity

In his hallmark work, Young (1966) explored the influence of boardinghouse groups on congressional voting over the Jeffersonian Era. He presented evidence that these intralegislative fraternal associations were influences of major significance upon the members' voting behavior, so that these social structures tended to institutionalize the difference among members. In a more recent study, Ferber and Pugliese (2000) further examined the influence of spatial proximity on the interpersonal communication patterns among legislators by analyzing seating and office shared locations. They found supportive evidence that seat proximity is positively related to the interpersonal communication patterns among members in the New York State Assembly. However, they could only weakly support the hypothesis that office proximity similarly influences these patterns. Masket (2008) explored data from three decades of roll call votes in the California Assembly and its seating rule allocation to show that legislators actively seek to their deskmates for cues, relying on this information and guidance to make voting choices that further their goals. Consequently, the influence of proximity extends to shaping how legislators interact, collaborate, and vote with one another, thereby molding the trajectory of political conflicts and legislative outcomes.

Use of randomization-based research design for the identification of spatial proximity effects has been effective in the context of homophily bias[6]. Using exogenous variation in seating within the legislature, Harmon et al. (2019) and Alquézar-Yus & Amer-Mestre (2024) identify the influence of spatial proximity on voting behavior in the European Parliament. Saia (2018) uses the random allocation of seats in the Iceland Parliament to identify the causal effect of social interaction on legislators' voting and speech behavior. He shows that the probability of failure to toe one's party line is higher, the higher the fraction of peers seated nearby casting votes that diverge from the party line, while peers' influence appears to have a sizable impact on legislator's speech behavior. Lowe & Jo (2024) and Darmofal et al. (2023) also explore the same setting to make causal claims of the effects of spatial proximity over voting behavior. Rogowski and Sinclair (2012) use the United States House of Representatives office lottery – in which newly elected members select their offices in a randomly assigned order – to obtain causal estimates of peer effects that are not biased due to homophily or endogeneity. Contrary to previous findings, they found no evidence that office proximity affects legislative behavior.

2.2 Mechanisms

Although the main specification does not allow me to perfectly distinguish a specific mechanism, my results are consistent with the mechanism of cue-taking. In their book, Matthews and Stimson (1975) point out that cue-taking refers to the mechanism of information sharing

[6]This methodology has been also widely used in the identification of peer effects in other different domains, such as education (Sacerdote, 2001; Zimmerman, 2003; Yakusheva et al., 2011) and workplace (Guryan et al., 2008). An alternative is to use research designs that attempt to control for homophily by incorporating additional covariates or leveraging natural experiments.

in which certain legislators serve as cue-givers, providing signals to their peers, while others act as cue-takers, receiving these signals and basing their voting decisions on them. Zelizer (2019) argues that spatial proximity among legislators leads to the formation of new cue-taking relationships. Closer spatial proximity reduces the barriers that typically hinder communication, representing a shortcut way of making reasonable decisions. For instance, sharing the same office floor reduces transaction costs associated with seeking guidance, facilitating easier access to information. Caldeira and Peterson (1987) demonstrated that spatial proximity facilitates the development of interpersonal ties among members, shaping the legislature by establishing channels of communication and enabling the connections necessary for bargaining, exchanging cues, and decision-making.

Legislators must turn to someone for cues on how to vote when there is a situation of a time constraint on the decision and the existence of an input deficiency or an input overload (Kingdon, 1989). His interview data show the informants have some claim to expertise 82 percent of the time. Legislators argue that in more complex decisions, they pick informants with some expertise on the legislation. The committee collectively and its members individually are potent cue-givers for the obvious reason of expertise. Cue-takers can pick and choose among the whole committee membership to find members whose attributes are most suitable, or with whom they have a close personal relationship. Uslane and Werger (1977) find that for cue-seeking, legislators in state legislatures look for cues from committee leaders more often than they look for cues from party leaders and party caucuses. Expertise and committee membership are interrelated, given the opportunity that members on the committee had to attend the hearings and listen to the experts. Santos (2002) finds that patterns of committee appointments in the Brazilian Congress show a positive and significant association between deputies' previous specialization and their likelihood of being part of control committees in the Brazilian Congress.

When examining contemporaneous effects of shared location, it's challenging to distinguish cue-taking from other potential mechanisms, like social pressure and peer pressure. This difficulty arises because both cue-taking and these other mechanisms exert influence only during social interactions and not afterward. Lowe and Jo (2024) add that legislators may take actions that conform to the neighbor's views to signal that they share an agreement or that they listen to the neighbor, perhaps to avoid stigma or conflict, and for the hedonic value of having a good relationship with neighbors. Also, in critical decisions where vote decisions are costly, legislators tend to exert peer pressure on their neighbors (Chan et al. 2019). In contested votes, individual vote becomes more important at the margin – since they have the power to change a roll call outcome. Therefore, legislators can be persuaded to deviate from their party's stance, to vote against their individual ideological position or their constituents preferences to favor a winning coalition.

3 Institutional Background

3.1 The Chamber of Deputies of Brazil

The Chamber of Deputies of Brazil[7] stands as a cornerstone of the country's democratic governance. Comprising elected representatives known as deputies, it serves as the lower house of the National Congress alongside the Federal Senate. This body embodies the essence of Brazil's representative democracy, charged with vital functions ranging from proposing and debating legislation to overseeing the use of public resources.

In total, 513 deputies are elected for a mandate of four year-term, coinciding with the legislature. The Chamber's composition reflects Brazil's regional diversity, with the number of deputies from each state determined by its population size[8]. From urban centers to remote rural areas, deputies bring the concerns and aspirations of their constituents to the legislative forefront.

Representatives are elected according to proportional electoral system. Brazil also follows an open list system. Unlike the closed list system where voters endorse a party's predetermined slate of candidates, the open list system allows to handpick individual candidates from within their chosen party or coalition. This electoral system results in a congress comprised of multiple political parties[9]. According to Ames (1995), this fragmented system prevents party leaders from exerting control over candidacies and, consequently, over party members' voting decisions within the congress. An opposite view defend that even though electoral laws may give politicians incentives to cultivate the personal vote and to defy the party line, individualistic behavior does not thrive in the milieu inside the Brazilian congress (Figueiredo and Limongi, 2000). They show by relying on roll call data that presidents have counted on reliable support on most of their propositions, the average level of discipline of the presidential coalition under their period of analysis is 85.6%. This evidence suggests that the legislative in Brazil functions on a coalition setting, in which presidents form governments, and the parties included in the governmental coalition provide political support for the president. More recently, Almeida (2018) revisited the president's legislative dominance over the period of 1989-2016 and proposed that its variation was caused by changes in the incentives of the legislators to delegate agenda power to the president and to participate in the legislative process, in the sense of producing laws of their own and controlling those originating from the Executive; and also that those incentives are associated with characteristics of parliamentary preferences and to the opportunity costs of these activities

One of the Chamber's pivotal functions is its participation in the legislative process. Bills can originate in either the Chamber of Deputies or the Federal Senate, but it is within the Chamber where many legislative initiatives take shape. Proposed laws undergo meticulous

[7] In portuguese, *Câmara dos Deputados do Brasil*.

[8] Minimum of 8 representatives per State and the Federal District (e.g. Acre) and maximum of 70 representatives per State (e.g. São Paulo).

[9] In the 55th legislature, 28 parties held representation, while in the 56th legislature, this number increased to 30 parties.

scrutiny, with multiple readings, debates, and committee reviews shaping their trajectory. This rigorous process ensures that legislation reflects the diverse perspectives and interests of Brazil's populace before advancing to the Senate for further consideration. As a forum for democratic deliberation, the Chamber of Deputies fosters vibrant discourse and negotiation among its members. Across party lines, legislators engage in robust debates, championing their respective policy agendas and advocating for their constituents. Through the lens of proportional representation, the Chamber embodies the pluralism inherent in Brazilian society, facilitating dialogue and compromise to advance the common good. Moreover, the Chamber's role extends beyond legislative endeavors to encompass broader democratic functions. It serves as a check on executive power, holding the government accountable through oversight mechanisms and investigations. From scrutinizing budget allocations to examining policy implementation, legislators exercise their mandate to ensure transparency and accountability in governance.

3.2 The Office Lottery

At the beginning of each legislative session, a unique tradition unfolds within the Chamber – the office lottery. The procedure of the office lottery involves two urns. In the first urn, the names of the deputies who will participate in the lottery are placed. Then, one name is drawn from this urn. Subsequently, in the second urn, the numbers corresponding to the available offices are placed. A number is drawn from this urn, and it is matched with the name drawn from the first urn. This process is repeated until all deputies have been assigned an office. This method ensures a fair and random allocation of offices among the deputies. For transparency, this procedure is broadcasted live on public television and made available on the Chamber's YouTube channel[10]. See Appendix A.1 for an illustration.

The criteria for the office lottery was established through the Act of Board No. 88, of 10/18/2006. Certain individuals are excused from the drawing process. These include former presidents of the Chamber of Deputies, persons with mobility impairments or special needs supported by a medical certificate from the House's Medical Department, individuals aged 65 or above by the beginning of the forthcoming Legislature, women, incumbents of the current legislature who have secured reelection, elected substitutes with a tenure of 365 days or more in the current Legislature, and former deputies who have served as titular members. Therefore, only first term male deputies participate in this ritual, being randomly allocated to vacant parliamentary offices. For example, in the 56th legislature, out of 262 newly elected deputies (19 of whom were former deputies), 154 actively participated in the lottery, totaling approximately 59%.

These offices serve as the operational hub for deputies and their teams, providing essential infrastructure to support their legislative endeavors. Within the main building of the Chamber, Annex I and II allocate high-ranking officials such as the current and former Speakers of the Chamber and most of the party leaders alongside with administrative offices and committee rooms. Complementing the main building are the Annexes III and IV, which offer additional

[10] https://www.youtube.com/live/N6P2_EsJUJo?si=TMv7Zm7TWzxgSakB

office accommodations for legislators. These annexes are interconnected with the main building, ensuring seamless access for legislators and staff as they navigate their daily responsibilities. Among the deputies elected in the legislatures under analysis, all were assigned either to Annex III or Annex IV[11]. See their office plans in Appendix A.2.

Since this study examines the impact of proximity on legislative behavior, it utilizes these office plans to define a measure of shared location, *Office Neighbors*. It takes in account all surrounding offices – whether they are located adjacent to each other, either directly next to, in front of, or diagonally across from each other.

Table 1 presents the descriptive statistics of the population of legislators and of the sample of legislators that participated in the lottery in the 55th and 56th legislatures.

Table 1: Descriptive Statistics of Legislators in the 55th and 56th Legislatures

Panel A: 55th legislature (2015-2018)

	Population	Lottery Sample
Total Number	513	137 (=27%)
Number of Men	463	137
Number of Women	50	0
Mean Age	61	53

Panel B: 56th legislature (2019-2022)

	Population	Lottery Sample
Total Number	513	154 (=30%)
Number of Men	436	154
Number of Women	77	0
Mean Age	55	49

In the 55th legislature, there were a total of 513 legislators, consisting of 463 men and 50 women. The average age of legislators was 61 years old. The average age of the lottery sample is lower because it primarily consists of first-term legislators, who typically tend to be younger.

Moving to the 56th legislature, there were shifts in gender representation: the number of male legislators decreased to 436, while the number of female legislators increased to 77. Percentage of men decreased from 90% to 84%. The average age of legislators in this term decreased to 55 years old.

These figures indicate changes in gender composition and potentially a younger cohort of legislators in the 56th legislature compared to the 55th.

3.3 Voting

In the Chamber of Deputies of Brazil, two main types of voting procedures are utilized to make legislative decisions. These procedures vary depending on the nature of the proposed legislation

[11]In the 56th legislature, out of the deputies who took part in the lottery, 101 were randomly assigned to Annex IV, whereas 53 were randomly assigned to Annex III.

and the level of consensus required among legislators.

Voice vote or acclamation is a voting method in which a group vote is taken on a topic or motion by responding vocally. Standing voting is a method where legislators express their vote by raising their hands or standing up rather than verbally stating their vote individually. These methods are commonly used for routine matters or procedural votes where there is a high level of consensus among legislators, and individual voting records are not required. They allow for a quicker and more informal process compared to roll call voting. However, it lacks the transparency of roll call voting as individual legislators' votes are not recorded.

Recorded or roll call voting[12] is a method where each legislator expressly announce their vote. This method is used for more significant legislative decisions or when there is a need for individual accountability and transparency. Roll call allow constituents and the public to know how each legislator voted on a particular issue.

In general, the choice between these methods depends on the nature of the vote and the level of transparency and accountability desired by the legislative body.

A vote is always related to a legislative proposal that can be initiated by any legislator in the Chamber. Legislative proposals differ in their scope, procedural requirements, approval thresholds, and consequences. Within the same legislative proposal, there could exist more than one voting procedure (for instance, while voting a proposal for tax reform, legislators might vote for the final passage of the proposal and to amend the text of the proposal). See Appendix A.2 for the description of the main type of legislative proposals and for the the distribution of votes over them across the two legislatures under analysis.

In the Chamber, legislators can cast their votes as "yes" (*sim*), "no" (*não*), "abstain" (*abstenção*), or "obstruction" (*obstrução*). Additionally, legislators may also be marked as "absent" (*ausente*) if they are not present to cast their vote. Obstruction typically refers to a procedural tactic taken by legislators, often aligned with their party, rather than an individual voting decision. It is taken to intentionally delay or impede the legislative process. This type of action is often used strategically by political parties or blocs to achieve certain objectives or to express opposition to particular measures being considered. Thus, in this analysis, votes marked as "obstruction‘ are not considered – since the paper's objective is to analyse individual legislative behavior.

Table 2 illustrates the distribution of recorded votes across the two legislatures. Approximately 65% of recorded votes are categorized as "yes" or "no," while absences account for 31% of the total recorded votes.

[12]In portuguese, *votação nominal*.

Table 2: Distribution of recorded votes — 55th and 56th legislature — Chamber of Deputies of Brazil.

Type	Freq.	Percent
Yes	241,825	33.4
No	231,001	32
Obstruction	24,025	3.3
Abstain	2,211	0.3
Absence	224,606	31
Total	723,668	100

3.4 Political Debate

According to the *Regimento Interno* (en. Internal Rule), there are seven possibilities for pronouncements: 1) when presenting a proposition; 2) during the *Pequeno* and *Grande Expediente* (en. Short and the Long shift) or during the phase of *Comunicações Parlamentares* (en. Parliamentary Communications); 3) when discussing measures being voted; 4) to raise a point of order; 5) to protest; 6) to send a vote; and, 7) for self-defense in case of an accusation considered undue (at the discretion of Speaker of the House). Such possibilities focus on different moments of the legislative process.

Floor debates are part of the ordinary sessions of the chamber and comprise four phases: Short Shift, Long Shift, Order of Business, and Parliamentary Communications. Each of these phases is also carefully regulated by the Internal Rule (Regimento Interno), which mainly addresses deputies' speech.

It is clear from the presentation of regulations on the chamber's speech policies that leaders have almost absolute control over the use of speech. Hence, there are two moments where representatives can intervene in the debates more freely and systematically: a) on the floor, during the Short Shift; and, b) in committees, during the Order of Business, when discussing the policies under consideration.

4 Empirical Strategy

4.1 Data

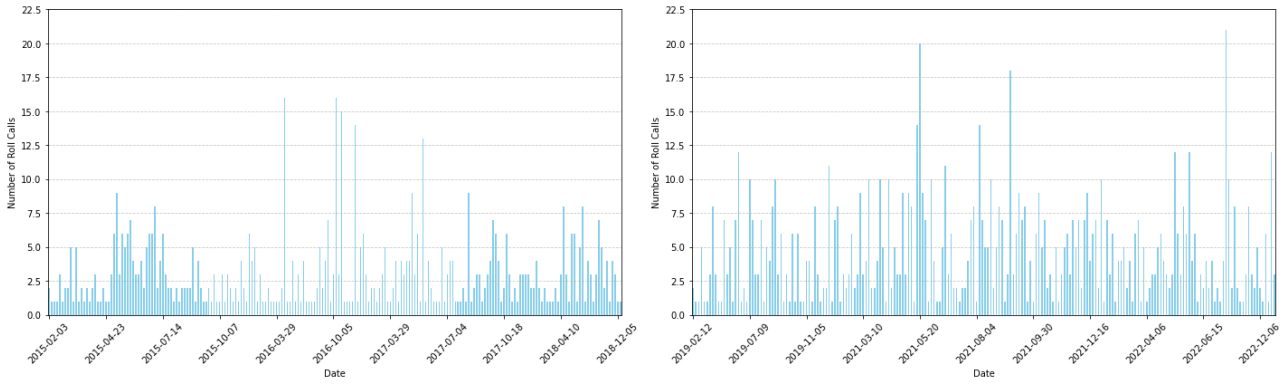
This paper uses data from both the 55th and 56th legislatures spanning from 2015 to 2022. These include the Dilma (2015-2016) and Temer (2016-2018) presidencies, as well as the Bolsonaro (2019-2022) presidency. The data was obtained by web scraping through the *Dados Abertos* (en. Open Data) platform[13] of the Chamber of Deputies of Brazil. Due to the empirical strategy's reliance on physical social interactions to understand peer effects, data from periods under the *Sistema de Deliberação Remota* (SDR) (en. Remote Deliberation System) were excluded[14][15].

Table 3 outlines the descriptive statistics, including the count of legislators participating in the lottery, the number of roll calls, and the number of speeches for each legislature. Figures 1 and 2 present the histogram of the daily distribution of roll calls and speeches, respectively[16].

Table 3: New members and activities in the 55th-56th legislatures

Legislature	No. of Legislators in the Lottery	No. of roll calls	No. of speeches
55th	137	738	17.016
56th	154	658	4.189

Figure 1: Number of Roll Calls per Day - 55th and 56th legislature



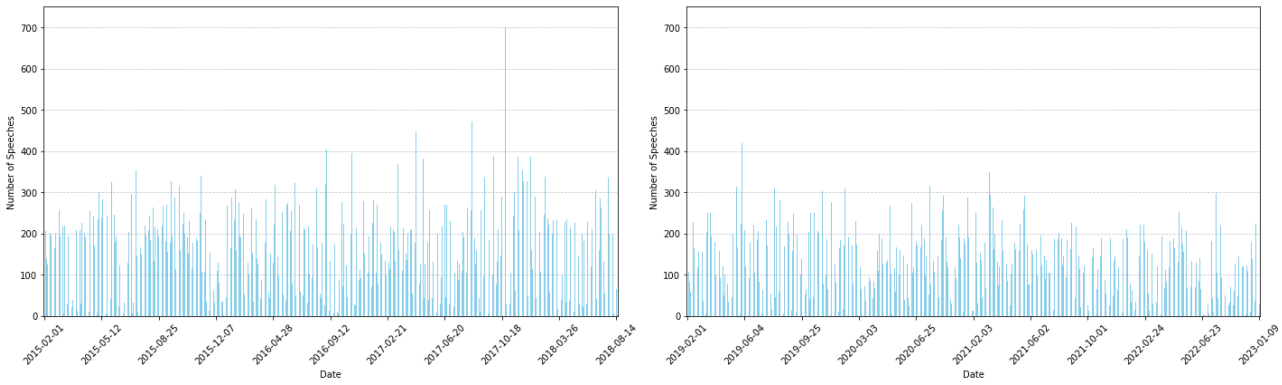
[13] https://dadosabertos.camara.leg.br/

[14] The COVID-19 pandemic caused significant disruptions to legislative operations. Beggining on March 17th, 2020, the Chamber of Deputies enacted the SDR, shifting all plenary activities, including roll calls, to a remote format and temporarily closing permanent committees. This arrangement persisted until February 11th, 2021, when a hybrid system was adopted, permitting legislators to reconvene in person in the plenary and restoring permanent committees to operation. This hybrid model continued until October 25th of the same year, when activities resumed normal operations. During a brief period in 2022, from the start of the legislative year in February until April 18th, the Chamber reinstated the SDR.

[15] This subset of data is used in section 4.1.1. for a robustness check.

[16] Data covering the periods under the SDR were included in these histograms for reference, even though they are not present in Table 3 and in the remaining part of this analysis.

Figure 2: Number of Speeches per Day - 55th and 56th legislature



The observed differences in the frequency of roll calls and speeches between the two legislative sessions possibly reflect variations in the political strategies, priorities, and coalition dynamics during the respective governments.

Additionally, significant events potentially affected the legislative behavior over these two legislatures. First, due to the presidential impeachment process during the 55th legislature, the Chamber's proceedings were significantly disrupted, leading to a notable impact on floor activity. The Chamber officially commenced discussions on the impeachment on December 2, 2015. Ultimately, on April 17, 2016, the legislators voted to proceed with the impeachment. As the impeachment proceedings unfolded, parliamentary activities were heavily focused on debates, committee hearings, and negotiations related to the impeachment vote. This intense focus on impeachment-related matters likely diverted attention and resources away from other legislative priorities, potentially leading to fewer roll calls on unrelated legislation during this period. Moreover, the disparity between the two legislative bodies can be also attributed to the influence of social distancing policies, including the adoption of the SDR and the closure of permanent committees, which significantly affected legislative activities during the 56th legislature.

4.2 Variables

4.2.1 Office Neighbors

Since the identification strategy relies on the random office alocation, among all pairs of legislators only those that contain at least one lottery participant are considered. There are two arguments for this restriction. The first is econometric: pairs containing two incumbents show no independence between their average potential outcomes and the treatment. The second is more intuitive: newly elected legislators have less established relationships within Congress and are more likely to form stronger ties with their office neighbors, whether those neighbors are other freshmen or incumbents.

Then, letting ij index pairs of legislators, the sample D_t is restricted to pairs in which either the legislator i or the legislator j (or both) was subjective to the office lottery. Therefore, I focus on the subset of pair of legislators $D_t \in U_t$, where $U_t = L_t \times L_t = \{(i, j) \mid i \in L_t \text{ and } j \in L_t\}$ is

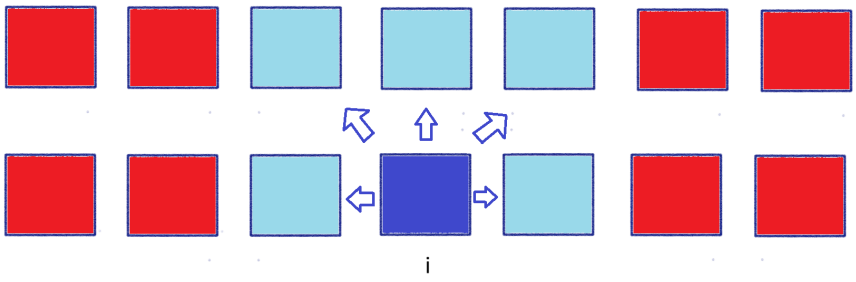


Figure 3: Neighboring Locations

the set of all possible combinations of pairs of legislators of the legislature t and L_t is the set that contains all legislators of the legislature t.

To explore the peer effects of office neighbors, I define the main independent variable *Office Neighbors*$_{ijt}$ as an indicator function of whether the pair of legislators ij shares the same office neighborhood in legislature t, with i never been taken as a neighbor of herself. Three different variations of the office neighborhood are employed. Starting from the most flexible one, *Office Neighbors*$_1$, is one that defines an office neighborhood by taking into account all surrounding offices – if they are located adjacent to each other, either directly next to, in front of, or diagonally across from each other. The second definition, *Office Neighbors*$_2$, considers offices adjacent or directly in front of each other. In the last and most parsimonious definition, *Office Neighbors*$_3$, only offices adjacent to each other are considered neighbors. The first definition is the most comprehensive and is taken as the main measure of office proximity.

Figure 3 illustrates the first measure and also provides a general view of a neighboring location. If we select an office i (shown in dark blue), any office j located in the light blue offices is considered a neighbor, while any office j located in the red offices is not. Therefore, an office i can potentially have up to 5 neighbors j (given that $ij \in D_t$)[17].

Thus, for every pair of legislators $ij \in D_t$ with $j \neq i$ and $t \in \{55, 56\}$, I set up the main independent variable *Office Neighbors*$_{ijt}$ as[18]:

$$\textbf{\textit{Office Neighbors}}_{ijt} = \begin{cases} 1 & \text{if legislators } i \text{ and } j \text{ share the same office neighborhood in legislature } t \\ 0 & \text{otherwise} \end{cases}$$

4.2.2 Measures of Legislative Behavior

To explore the impact of spatial proximity on legislative behavior, I analyze all pairs of legislators $ij \in D_t$ per roll call p, in which legislators vote and are present. Thus, in the main

[17] If an office i is located at the end of the hallway, it will have fewer neighbors (3 instead of 5).
[18] All duplicate pairs of the form ij and ji are removed from the sample

analysis, I take in account only the "yes" and "no" vote decisions. See Appendix A.4 for an alternative analysis, which takes in account "yes", "no", "abstain" and "abstention" votes.

As a measure of legislative behavior, I define the agreement score $Convergence_{ijpt}$ as an indicator function for whether the pair of legislators ij cast the same vote on the roll call p during the legislature t.

Thus, for every pair of legislators $ij \in D_t$ voting on roll call p with $j \neq i$, $p \in R_t$ and $t \in \{55, 56\}$; where R_t is the set that contains all the roll calls of the legislature t. I set $Convergence_{ijpt}$ as:

$$\boldsymbol{Convergence}_{ijpt} = \begin{cases} 1 & \text{if legislators } i \text{ and } j \text{ cast the same vote on roll call } p \text{ during legislature } t \\ 0 & \text{otherwise} \end{cases}$$

Table 4 provides summary statistics for the main analysis and all main variables. Same party is an indicator for whether a pair of legislators is from the same party at the time of the proposal's vote. Same coalition is an indicator for whether a pair of legislators is from the same coalition at the time of the proposal's vote. Same state is an indicator for whether a pair of legislators is from the same state at the time of the proposal's vote. Same gender is an indicator for whether a pair of legislators shares the same gender. Ideological distance is defined by taking the absolute difference between the Brazilian Legislative Survey scores (Zucco, 2023) of the members of each pair, with ideological positions being assigned according to party membership. Age difference is the absolute difference between the age of the members of each pair.

Table 4: Pair-Level Summary Statistics

	$Convergence_1$ (only "Yes" and "No" votes)				
Variable	Mean	St.Dev.	Minimum	Maximum	N
Convergence	0.690	0.462	0	1	41,400,152
Office neighbors$_1$	0.0078	0.088	0	1	41,400,152
Office neighbors$_2$	0.0045	0.067	0	1	41,400,152
Office neighbors$_3$	0.0027	0.052	0	1	41,400,152
Same party	0.0642	0.245	0	1	41,400,152
Same coalition	0.599	0.489	0	1	41,400,152
Same state	0.0652	0.246	0	1	41,400,152
Same freshman status	0.173	0.378	0	1	41,400,152
Same gender	0.934	0.246	0	1	41,400,152
Ideological Distance	0.526	0.472	0	1.89	41,400,152
Age diff.	13,66	9.84	0	62	41,400,152

4.3 Identification

Since the Internal Rule allows for office-swapping (after the lottery is run and the first term male legislators are randomly allocated), non-compliance cannot be ruled out. Thus, the empirical

strategy follows an intent-to-treat analysis (ITT). This is called intent-to-treat analysis because it measures the causal effect of intended treatments, rather than the treatment outcomes. Since not all legislators who are randomly assigned to offices actually remain there, we should expect the ITT effect to be strictly smaller than the average treatment effect.

With this pair-wise sample D_t and variables, the intent-to-treat (ITT) estimate, β_1, can be obtained from the following specification:

$$\text{Convergence}_{ijpt} = \beta_0 + \beta_1 \cdot \text{Office neighbors}_{ijt} + \mathbf{B_2} \cdot \mathbf{X_{ijt}} + \mu_t + \delta_p + \epsilon_{ijpt} \tag{1}$$

Where $\mathbf{X_{ijt}}$ is a vector of covariates (including ideological distance, same party or coalition, same state, same freshman status, same gender and age difference), μ_t represents legislature fixed effects, δ_p denotes fixed effects for legislative procedural voting and ϵ_{ijpt} is the error term. It is assumed that *Office neighbors*$_{ijt}$ is orthogonal to the error term ϵ_{ijpt} given the random office allocation.

Standard errors are two-way cluster-robust, taking into account the correlation between pairs (i, j) and (i', j') when i = i' or j = j'.

I use randomization inference to calculate Fisher's exact p-values. I simulate placebo seating assignments following the exact procedure of the Chamber for assigning offices. The advantage of randomization inference is that it provides an exact test against the sharp null hypothesis of no treatment effects without relying on asymptotic assumptions (Imbens and Rubin, 2015).

It is important to note that the parameter of interest, β_1, measures the influence of office proximity within a pair – that is, influence could potentially go in both directions (from deputy i to deputy j and/or from deputy j to deputy i). If the influence is positive (i.e., deputies located into the same office neighborhood positively influence themselves), their behavior converge.

The covariate balance tests are shown in Table 5. I replace the left-hand variables of the main specification with other pre-determined characteristics of the legislators' pair.

Table 5: Covariate Balance Table

	Dependent variable:					
	Same party	S. coalition	S. state	S. gender	Id. dist.	Age diff.
Office neighbors	-0.68	0.21	-0.02	1.91**	-0.0189	-0.8155***
	(0.8)	(1.6)	(0.8)	(0.9)	(0.016)	(0.310)
Observations	41,400,152	41,400,152	41,400,152	41,400,152	41,400,152	41,400,152

Notes: Two way cluster-robust standard errors. Columns (1)-(6) report the covariate balance tests using the covariates as outcomes.Office neighbors is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Same party is an indicator for whether a pair of legislators is from the same party at the time of the proposal's vote. Same coalition is an indicator for whether a pair of legislators is from the same coalition at the time of the proposal's vote. Same state is an indicator for whether a pair of legislators is from the same state at the time of the proposal's vote. Same gender is an indicator for whether a pair of legislators shares the same gender. Age difference is the absolute difference between the age of the members of each pair. These variables are self-explanatory. $p<0.1$ **p<0.05; ***p<0.01

The results show statistically significant effects for same gender and age difference. A potential explanation for these stronger effects is that women can self-select in specific office neighborhoods (since they do not participate in the lottery), thus forming clusters within the floors. Thus, it is more likely for the treatment to select pairs containing two men. Also, since the sample is restricted only to pairs containing at least one participant in the lottery, and those are usually younger, the likelihood of the treatment selecting pairs with smaller age differences is greater. The older incumbent also can self-select into specific office neighborhoods. By controlling for floor fixed effects, these point estimates are no longer statistically significant. The joint test for orthogonality also shows no statistical significance; it suggests that these covariates are jointly orthogonal to the treatment, meaning that differences in covariates are likely due to random variation rather than selection biases. Therefore, this empirical evidence shows that the office lottery was correctly randomized.

5 Empirical Results

5.1 Estimation of Peer Effects

Table 6 displays the results of the ITT analysis. All standard errors, reported in parentheses, are two-way cluster-robust.

Table 6: Pair-Level Effects on Voting: Main Analysis (p.p.)

	Dependent variable: Convergence				
	(1)	(2)	(3)	(4)	(5)
Office neighbors	0.83	0.26	0.21	0.07	0.19
	(0.8)	(0.6)	(0.6)	(0.8)	(0.9)
Ideological distance		-28.0***	-28.0***	-28.0***	-28.0***
		(1.30)	(1.30)	(1.30)	(1.30)
Same party		3.30***		3.30***	3.30***
		(0.8)		(0.8)	(0.8)
Same coalition			1.43***		
			(0.4)		
Same state		0.15	0.22	0.15	0.15
		(0.4)	(0.4)	(0.4)	(0.4)
Same gender		0.73	0.62	0.73	0.73
		(0.9)	(0.9)	(0.9)	(0.9)
Age difference		-0.07***	-0.07***	-0.07***	-0.07***
		(0.4)	(0.4)	(0.4)	(0.4)
Voting FE	No	Yes	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes	Yes	Yes
Observations	41,400,152	41,400,152	41,400,152	41,400,152	41,400,152
Number of roll calls	1,396	1,396	1,396	1,396	1,396
Outcome Mean	0.690	0.690	0.690	0.690	0.690

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. The outcome, *Convergence*, is an indicator of whether the pair of legislators agreed in the roll call vote. Column (1)-(5) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement. Column (1) uses *Office Neighbors*$_1$ to define the spatial proximity effect, which is one that defines an office neighborhood by taking in account all surrounding offices – if they are located adjacent to each other, either directly next to, in front of, or diagonally across from each other. It does not include any covariates and only controls for congress fixed effects. Column (2) also uses *Office Neighbors*$_1$ and includes the complete set of covariates plus voting fixed effects. Column (3) keeps *Office Neighbors*$_1$ and the same specification as column (2) but the same party variable – it replaces this covariate by same coalition. Column (4) uses the same specification as column (2) but for the spatial proximity effect it considers the second definition, *Office Neighbors*$_2$, in which offices adjacent or directly in front of each other are considered neighbors. Column (5) uses the same specification as column (2) but for the spatial proximity effect it considers the most parsimonious definition, *Office Neighbors*$_3$, in which only offices adjacent to each other are considered neighbors. Ideological distance is defined by taking the absolute difference between the BLS scores of the members of each pair. *Same party* is an indicator for whether a pair of legislators is from the same party at the time of the proposal's vote. *Same coalition* is an indicator for whether a pair of legislators is from the same coalition at the time of the proposal's vote. *Same state* is an indicator for whether a pair of legislators is from the same state at the time of the proposal's vote. *Same gender* is an indicator for whether a pair of legislators shares the same gender. *Age difference* is the absolute difference between the age of the members of each pair.*p<0.1; **p<0.05; ***p<0.01

In columns 1, 2 and 3 the spatial proximity variable is *Office Neighbors*$_1$, which is one that defines an office neighborhood by taking in account all surrounding offices – if they are located adjacent to each other, either directly next to, in front of, or diagonally across from each other. Column 4 uses, for the spatial proximity effect, the second definition, *Office Neighbors*$_2$, in which offices adjacent or directly in front of each other are considered neighbors. Column (5) uses the most parsimonious definition, *Office Neighbors*$_3$, in which only offices adjacent to each other are considered neighbors.

In the first column (1), the main specification is estimated without including the set of covariates and the voting fixed effects (it only includes legislature fixed effects), resulting in a point estimate of 0.83 percentage points and statistically non significant. Moving to column 2, covariates and voting fixed effects are included, it similarly presents a statistically non-significant result with a smaller point estimate of 0.26 p.p. In columns 3, the covariate same party is replaced by same coalition and the point estimate remains close to the one observed in column (2). For robustness, columns 4 and 5 show results for the same specification as column 2, but use alternative definitions of office neighbors. Despite this adjustment, the ITT estimate do not present great difference and remains statistically non-significant

The results show that, on average, office proximity increases agreement by 0.26 percentage points. This effect amounts to 8 p.p. of the influence of same party membership. The point estimate is consistent with other studies analyzing the influence of spatial proximity on co-voting behavior. Rogowski and Sinclair (2012), using data from the U.S. House of Representatives, also found not statistically significant results and their point estimate lies within our confidence interval. Darmofal et al. (2023) analyze roll call voting under random seating assignment in the Iceland Parliament and also find null effects. Lowe and Jo (2024) point estimate, using a specification that emphasizes spatial proximity effects on cross-party pairs and data from the Iceland Parliament, also lies within our confidence interval range. Harmon et al. (2019) estimated, using data from the European Parliament, a 0.6 p.p. effect of spatial proximity on co-voting behavior – which is also covered by our CI.

Although I find an average treatment effect that is small and not statistically distinguishable from zero, most votes in the sample are cast on procedural matters, where there is little variation, as legislators typically toe the party line or follow their ideological position. It might be that these influences are potentially masking the effects of spatial proximity on the voting convergence within pairs of legislators. Therefore, it is important to study the potential heterogeneous effects of spatial proximity to help uncover some potential dimensions of stronger influence.

5.2 Heterogeneity in Peer Effects

Heterogeneity analysis is first ran taking into account the importance of voting by emphasizing non-procedural decisions. One example of non-procedural voting are disputed votes, where roll calls have narrow victory or defeat margins. Table 7 shows empirical evidence supporting the direct influence of officemates on voting agreement in contested decisions.

Table 7: Pair-Level Effects on Voting: Result Margin Heterogeneity (p.p)

	Dependent variable: Convergence	
	$> 5\%$	$< 5\%$
Office neighbors	0.20	2.0***
	(0.6)	(1.0)
Controls	Yes	Yes
Voting type FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	40,052,049	1,308,783
Number of roll calls	1,359	36
Outcome Mean	69.1	49.7

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Convergence is an indicator of whether the pair of legislators agreed in the proposal's vote. Office neighbors is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Column (1) reports the proximity effect for roll calls with more than 5 p.p. result margin. Column (2) reports the proximity effect for roll calls with less than 5 p.p. result margin Covariates included are same party, ideological distance, same state, same gender, and age difference. These variables are self-explanatory. *p<0.1; **p<0.05; ***p<0.01

Votes for highly contested roll calls, with a margin of less than 5 p.p., show a statistically significant estimate of 2 percentage points – roughly eight times the magnitude of the average effect. They are also robust to randomization inference. With 400 draws, I estimate a Fisher's exact p-value of 0.0575, see Figure 4.

Table 8 shows spatial proximity effects in co-voting behavior on roll calls with different result margins. It categorizes result margins into five groups: greater than 10 p.p., less than 50 p.p., less than 25 p.p., less than 10 p.p., and less than 5 p.p.

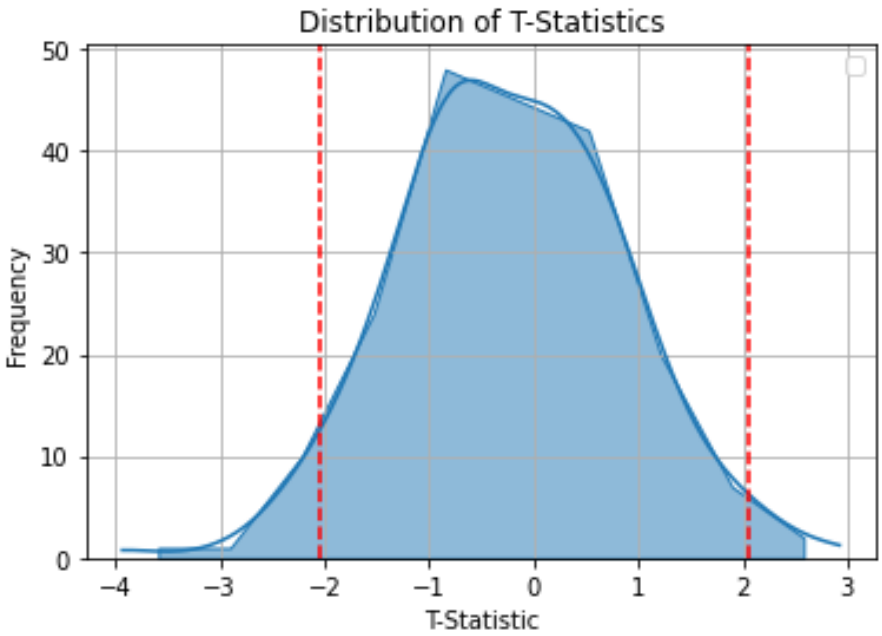


Figure 4: Randomization Inference for causal estimate (sample: 5 p.p. result margin)

Table 8: Pair-Level Effects on Voting: Result Margin Heterogeneity (p.p.)

	Dependent variable: Convergence$_1$			
	$> 10\%$	$< 50\%$	$< 25\%$	$< 10\%$
Office neighbors	0.6	1.3	2.0***	1.5**
	(0.7)	(1.0)	(0.7)	(0.7)
Controls	Yes	Yes	Yes	Yes
Proposal type FE	Yes	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes	Yes
Observations	28,908,654	17,062,992	6,381,415	2,498,300
Outcome Mean	69.1	56.3	51.0	49.9

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Columns (1)-(4) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement in roll calls with different margin of victory/defeat. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *same state*, *ideological distance*, *same gender*, and *age difference*. These variables are self-explanatory. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

When the result margin is greater than 10 p.p., the point estimate is 0.6 p.p., closer to the point estimate of the average effect in voting agreement. Mainly due to the predominance of comfortable and procedural votes in the sample, it suggests that legislators are less swayed by their office neighbors in uncontested voting situations.

For result margins less than 50 p.p., the impact of proximity increases the likelihood of

agreement to 1.3 p.p. Though statistically insignificant, the effect size is relatively modest compared to smaller result margins. For winning margins less than 25 p.p., the probability increases to 2 p.p., suggesting a more substantial impact of office neighborhood proximity on voting behavior. This effect is statistically significant at the 1 p.p. level. For result margins less than 10 p.p., the probability decreases to 1.5 p.p., but remains statistically significant at the 5 p.p. level. Although smaller in magnitude, the effects of spatial proximity remain robust with larger result margins (10 p.p. and 25 p.p.). If we consider an agreement score that takes in account absences and abstain votes, the estimates stay consistent (see table 18 in the Appendix A.4).

This evidence suggests that office proximity, functioning as a social structure, plays an important role in non-procedural decisions, complementing other sources of influence, whether ideological or non-ideological (Zucco Jr. and Lauderdale, 2011). Evidence of spatial proximity effects on contested decisions was identified in earlier studies. Harmon et al. (2018) estimated that the peer effects in these close votes are about twice those found for "comfortable" vote effects. Young (1966) revealed that the more evenly divided the House sentiment and the more closely contested the issue, the greater the reliance upon messmates for political cues. Masket (2008) and Lowe & Jo (2023) find stronger deskmate influence on contested votes than detected in lopsided votes.

Legislators argue that in more complex decisions, they pick informants with some expertise on the legislation (Matthews and Stimson, 1975; Kingdon, 1989). The committee collectively and its members individually are potent cue-givers for the obvious reason of expertise. Expertise and committee membership are interrelated, given the opportunity that members of the committee had to attend the hearings and listen to the experts. Santos (2002) finds that the patterns of committee appointments in the Brazilian Congress show a positive and significant association between the previous specialization of the deputies and their likelihood of being part of control committees in the Brazilian Congress.

Thus, I further explore the relationship between office proximity and committee membership to explain influence in co-voting patterns. Equation (2) presents a specification that interacts the office proximity variable, Office neighbors$_{ijt}$, with an indicator of whether a legislator within a pair is a member of the committee related to the subject of the roll call voted on, Committee$_{ijt}$:

$$\begin{aligned} \text{Convergence}_{ijpt} = \beta_0 &+ \beta_1 \cdot \text{Office neighbors}_{ijt} + \beta_2 \cdot \text{Committee}_{ijt} \\ &+ \beta_3 \cdot \text{Committee}_{ijt} \times \text{Office neighbors}_{ijt} \\ &+ \mathbf{B_4} \cdot \mathbf{X_{ijt}} + \mu_t + \delta_p + \epsilon_{ijpt} \end{aligned} \tag{2}$$

Where $\mathbf{X_{ijt}}$ is a vector of covariates (including ideological distance, same party or coalition, same state, same freshman status, same gender and age difference), μ_t represents legislature fixed effects, δ_p denotes fixed effects for legislative procedural voting and ϵ_{ijpt} is the error term. It is assumed that *Office neighbors*$_{ijt}$ is orthogonal to the error term ϵ_{ijpt} given the random office allocation.

Table 9: Pair-Level Effects on Voting: Interaction of Spatial Proximity and Committee Membership (p.p.)

	Dependent variable: Convergence	
	$> 5\%$	$< 5\%$
Office neighbors	0.24	1.04
	(0.6)	(1.0)
Committee	-0.58	0.04
	(0.2)	(0.2)
Committee × Office neighbors	-0.17	4.51***
	(0.5)	(1.7)
Controls	Yes	Yes
Voting FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	39,556,744	1,308,783
Number of roll calls	1,347	36
Outcome Mean	69.1	49.7

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Convergence is an indicator of whether the pair of legislators agreed in the proposal's vote. Office neighbors is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Committee is an indicator of whether one legislator within a pair is member of the committee related to the subject of the roll call being voted. Column (1) reports the proximity effect for roll calls with more than 5 p.p. result margin. Column (2) reports the proximity effect for roll calls with less than 5 p.p. result margin Covariates included are same party, ideological distance, same state, same gender, and age difference. These variables are self-explanatory. *p<0.1; **p<0.05; ***p<0.01

Table 9 shows that the point estimate of the coefficient of the interaction term (β_3) is 4.51 percentage points for roll calls with a result margin of less than 5 p.p. – and remain robust with a result margin of less than 10 p.p. The results remain robust under randomization inference. With 400 draws, I estimate a Fisher's exact p-value of 0.0267, see Figure 5.

Since committee assignments are endogenously defined, there is a potential concern that unobserved factors influencing committee membership could also affect legislative behavior, introducing bias into the analysis. To address this issue, I restricted the analysis to committee members selected at the beginning of each legislative session, ensuring that membership is less likely to be influenced by evolving legislative dynamics. Even without this restriction the results remain robust, supporting the reliability of the findings. Additionally, I created an indicator variable to identify pairs of legislators who both served on the same committee. The interaction between this indicator and the office neighbors variable was tested to assess whether shared committee membership among office neighbors influenced outcomes. This lack of significance indicates that the observed effects are likely driven by information flows from more informed legislators, rather than by simple co-membership in a committee.

This empirical evidence suggests that when confronted with the necessity of making a quick

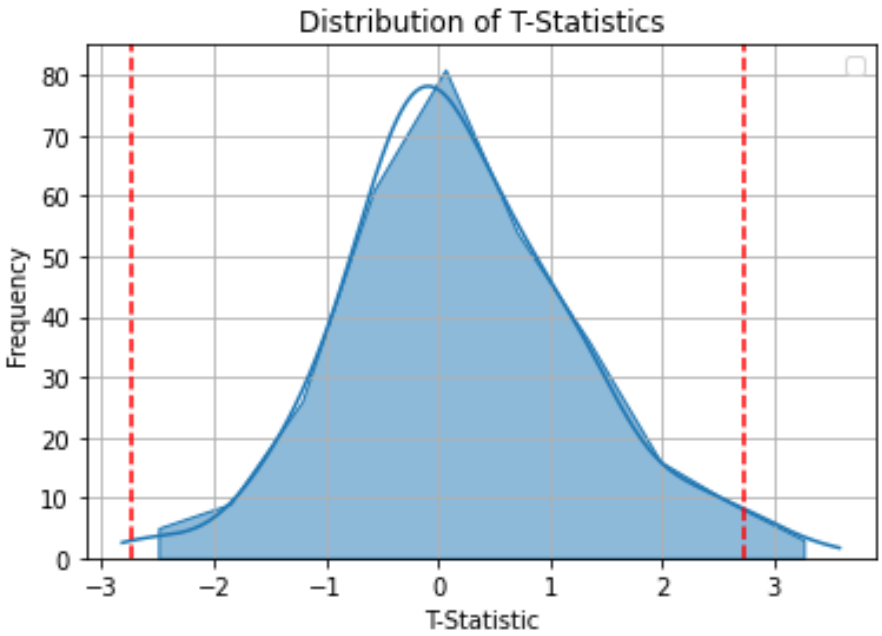


Figure 5: Randomization Inference for Interaction of Office Neighbors and Committee.

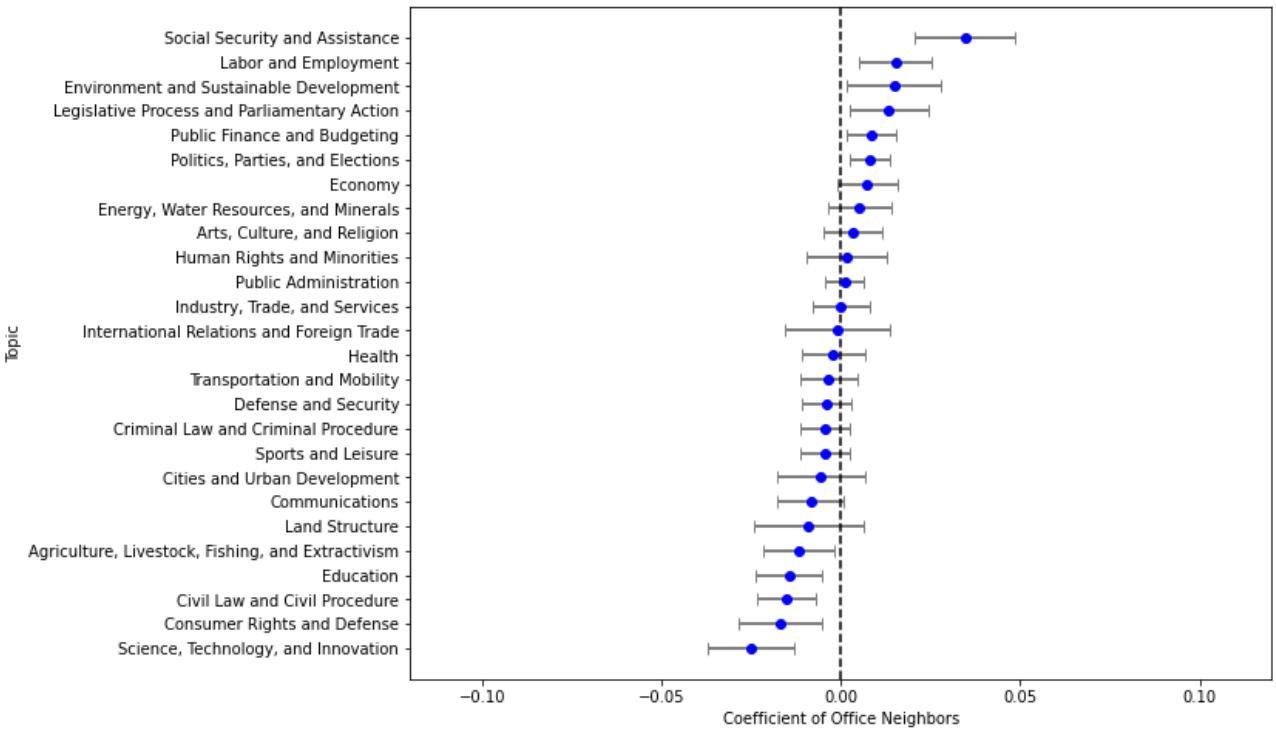
low-information decision on legislation, they can look to individuals who have made up their minds early and are perceived to be experts – therefore, committee membership and office neighborhood are complements on contested decisions. These experts usually are members of the standing committee that reported the measure to the floor. Legislators coped with uncertainty about the consequences of voting one way or the other by using the voting intentions of trusted, expert colleagues to decide how to vote (Uslane and Werger, 1977). These findings demonstrate the importance of spatial proximity in the diffusion of information and emphasize the informational role of committees in Congress.

If committee membership shapes the flow of information in Congress, it raises questions about its potential impact on policy-making – especially on contested decisions, where the influence is greater and the likelihood of votes altering the roll call outcome is higher. The asymmetry of information naturally brings loss to the floor, so that committee members have greater influence over the design of the bill. This cost will be compensated for by the informational gains due to the reduction of uncertainty. Pereira and Mueller (2004) adapts Gilligan and Krehbiel (1989) model of strategic communication to the Brazilian Congress and show the committees that are more representative of the floor that would have a greater effect of reducing uncertainty in equilibrium. On the other hand, if all the cue-givers in a policy domain tend to be a biased sample of the Congress, the probability of unrepresentative policy decisions is very substantial. To illustrate this, Appendix A.5 uses the Brazilian Legislative Survey's (BLS) ideological estimates (Zucco, 2023) to compare the standing committees medians to the floor median. It shows that, in that sample, control committees (CCJC and CFT) are more representative of the floor compared to thematic committees (as exemplified by CCULT). Therefore, this exercise highlights the potential for standing committee memberships to significantly influence policy-making, as committees that shape the flow of information may drive decisions in

ways that reflect their own ideological biases, potentially leading to policy outcomes that are less representative of the broader legislative body.

Another potential source of treatment effect heterogeneity to explore is the variation across the roll calls' topics. Each roll call is categorized by the Chamber of Deputies into one of 28 possible topics[19]. Thus, I also analyze how the treatment effects varied across different roll call topics. Figure 6 shows the estimates of the Office Neighbors' coefficient using the main specification with all controls and fixed effects included. It shows that the treatment effects – the effect of belonging to the same office neighborhood on voting convergence – present a different size and direction depending on the topic being voted on. In particular, roll calls related to the topic of Social Security & Welfare show a relatively larger and statistically significant heterogeneous treatment effect of 3.4 p.p. The heterogeneous treatment effects for roll calls on the topic of Labor & Employment also present statistically significant effects of 1.52 p.p. On the other hand, the topic Science, Technology & Innovation presents an inverse relationship of our previous estimates – the same is true for other topics, such as Consumer Rights & Defense, Civil Law & Civil Procedure, and Education. All other heterogeneous treatment effects are not distinguishable from zero – or just marginally.

Figure 6: Heterogeneity analysis on roll calls' topics



These findings show that for the two legislatures under analysis, heterogeneous treatment effects are stronger on topics related to labor and social security. The next step of the analysis is to explore other potential dimensions of influence within each topic to understand what

[19]Only 26 topics are shown in Figure 6 and table 19. The topics of Law & Justice and Tributes & Commemorative Dates were removed due they presented very few observations and due to a limited number of observations – and abnormal standard errors - and very low F statistics.

could be driving these larger effects. Thus, in Appendix A.3, the distribution of topics by types of legislative proposal is shown. The topic that presented the largest treatment effect, Social Security & Welfare, is composed of about 90 p.p. of Provisional Measures (MPV)[20]. The second one, Labor & Employment, is composed of approximately 63 percentage points of Provisional Measures. These percentages are comparatively higher to a global average of approximately 30 p.p. of Provisional Measures per topic. The Provisional Measure is a type of executive order with the force of law immediately upon issuance, but subject to review and approval by the Chamber. Therefore,

According to Kingdon (1989), bargaining in the legislative may involve personal favor-trading, where a vote becomes a credit which can be called in later. In multiparty presidential systems such as Brazil, an executive must exchange robustly with the legislative branch by using the influence of pork and patronage. The Brazilian executive controls the disbursement of pork to legislators through the execution of individual and collective budgetary amendments, and determines the proportionality of partisan representation within the cabinet. One significant challenge posed by this system is its multitude of potential partners that turn the office neighborhood into a potential network of influence for the executive. This social structure could help reduce the transaction costs associated with forming winning coalitions. Since Provisional Measures are the executive's primary legislative tool, they serve as the traditional means for the executive to direct policy, further emphasizing the role of these networks in shaping legislative outcomes. Thus, one can hypothesize that party and government leaders could exploit this spatial proximity to alter voting outcomes – and this effect could be perceived through the patterns of co-voting on Provisional Measures.

In table 10, I test this hypothesis and investigate how type of proposition heterogeneity influences pair-level voting behavior among legislators. It presents the analysis divided into seven categories[21], respectively: PL (Proposed Law), PEC (Proposed Constitutional Amendment), MPV (Provisory Measure), PLP (Proposed Complementary Law), PDC (Proposed Decree of Congress), PRC (Resolution Project), and PDL (Proposed Decree of Legislative).

[20] In particular, the set of roll calls on the topic of Social Security & Welfare involves 5 different Provisional Measures: MPV 665/2014, MPV 676/2015, MPV 780/2017, MPV 1099/2022, and MPV 1113/2022.

[21] See Appendix A.3 for the description of the main type of legislative proposals and for the distribution of votes over them across the two legislatures under analysis.

Table 10: Pair-Level Effects on Voting: Proposition Type Heterogeneity (p.p.)

	Dependent variable: Convergence						
	PL	PEC	PLP	MPV	PDC	PRC	PDL
Office neighbors	0.5	0.8	0.9	1.1	0.3	0.3	-0.3
	(0.6)	(1.0)	(0.9)	(1.1)	(0.9)	(2.4)	(1.1)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,975,715	6,665,089	3,297,855	10,106,397	1,121,658	53,656	179,782
Outcome Mean	69.2	68.9	68.6	68.7	68.6	75.7	73.4

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Columns (1)-(7) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement across different types of legislative proposals. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *same state*, *ideological distance*, *same gender* and *age difference*. *p<0.1; **p<0.05; ***p<0.01

Across various types of propositions, the point estimates vary from -0.3 p.p. (PDL) to 1.1 p.p. (MPV), indicating diversity in the strength and direction of the relationship between office neighborhood proximity and voting agreement across different legislative proposals. However, the point estimates are not distinguishable from zero.

Overall, it shows that for Provisional Measures (MPV) legislators in close proximity exhibit a stronger tendency for agreement. However, this point estimate is not statistically significant, indicating that MPV alone is not a substantial influence on legislators' ability to sway the opinions of their neighbors. It, therefore, reveals that type of proposition does not represent an important dimension of heterogeneity in the analysis of the influence of spatial proximity on co-voting patterns.

Other potential dimensions of heterogeneity are their shared social characteristics. Therefore, heterogeneity analysis is also ran by examining whether office neighbors that share salient social characteristics (namely gender, state of origin, freshman status, and party and coalition affiliation) influence each other more. Harmon et al. (2019) argue that shared social characteristics might strengthen peer effects either because of the greater deference that individuals show toward the ideas and interests of in-group members or because social connection leads to more communication, and thus greater influence.

Figure 7: Heterogeneity analysis on legislators' characteristics

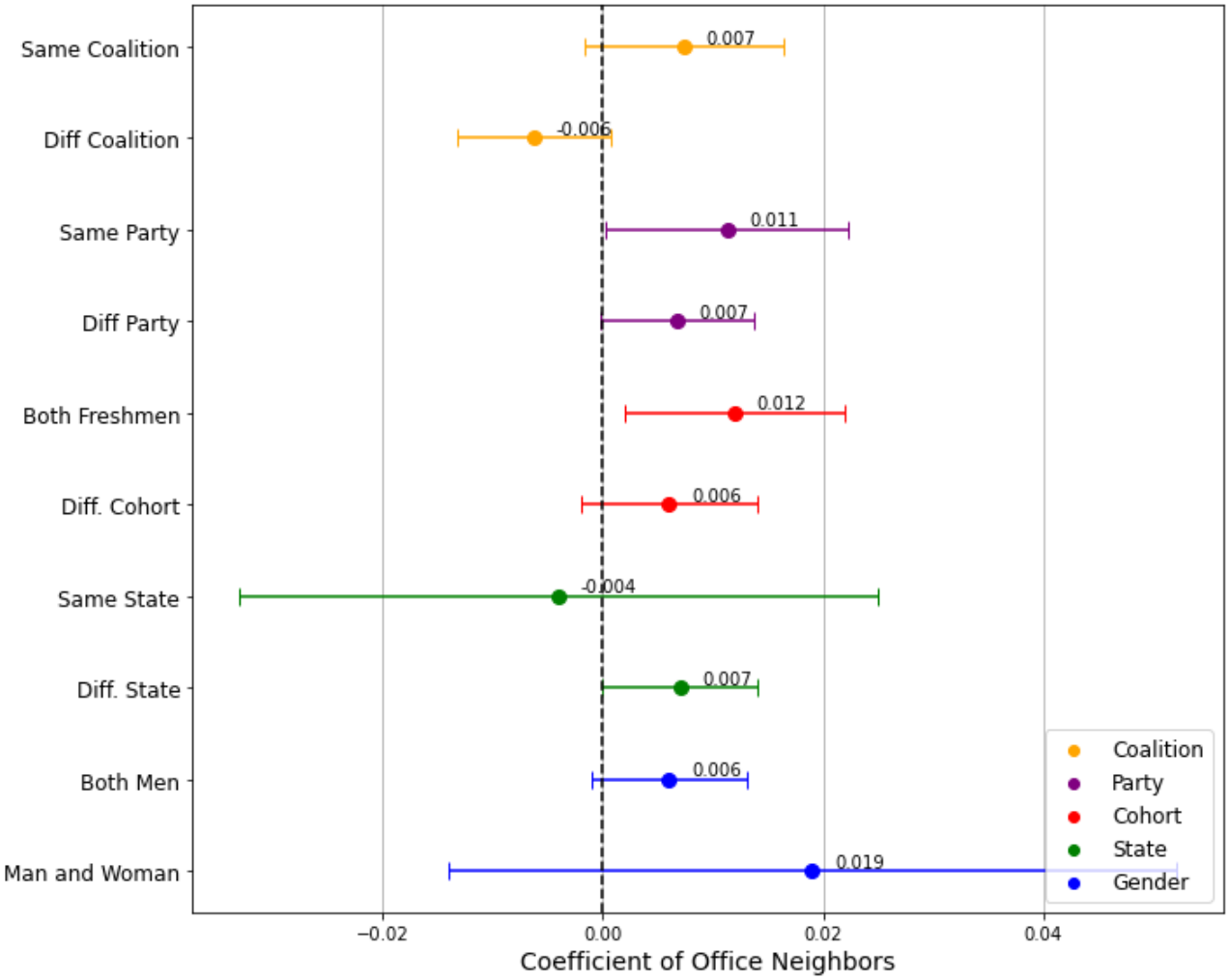


Figure 7 reveals that the impact of belonging to the same office neighborhood on voting agreement varies across various factors, including party and coalition affiliation, state of origin, cohort, and gender. In particular, pairs sharing the same freshman status look statistically significant, whereas the same (and different) party and the different state of origin only look marginally distinguishable from zero. Across various dimensions, the heterogeneity tends to converge to the voting agreement rate of 0.8 p.p. There is a notable difference when comparing pairs consisting of a male and a female legislator with those formed by two male legislators[22]. In the former category, the coefficient is 1.9 p.p. with a standard error of 3.3, while in the latter one it is 0.6 p.p. with a standard error of 0.7.

Legislators from different coalitions who are in close proximity are less likely to agree in their voting decisions, with a decrease in agreement of 0.6 p.p. Additionally, when legislators from the same state are in close proximity, office proximity tends to favor disagreement in voting decisions, with a decrease in agreement of 0.4 p.p. (SE = 2.9).

[22]Since pairs must contain at least one participant of the office lottery, pairs with both female legislators are not present.

5.2.1 Robustness Check: Alternative Definitions of Relevance

I also explore other definitions of voting relevance rather than the result margin of victory. An alternative is to consider the relevance of the individual vote for each legislator. Thus, this study adapts the Battaglini et al. (2023a) approach, in which roll calls are classified as relevant or not based on the salience of the topic being voted on by each legislator. This approach utilizes co-sponsorship data to determine the frequency with which each legislator has supported each topic, considering the least frequent topic as not relevant.

Table 11: Pair-Level Effects on Voting: Individual Vote Relevance Heterogeneity (p.p.)

	Dependent variable: Convergence		
	Non relevance for both	Relevant for one	Relevant for both
Office neighbors	1.57	1.53	0.18
	(1.3)	(1.0)	(0.8)
Controls	Yes	Yes	Yes
Proposal type FE	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes
Observations	863,342	4,859,778	13,254,169
Outcome Mean	70.15	67.0	69.1

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Roll calls are classified as relevant or not based on the salience of the topic being voted on by each legislator. Standard errors are clustered at the legislator individual level. This approach utilizes co-sponsorship data to determine the frequency with which each legislator has supported each topic, considering the least frequent topic as not relevant. Columns (1)-(3) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *same state*, *ideological distance*, *same gender*, and *age difference*. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table 11 reveals the highest point estimate (1.57 p.p.) for roll calls involving topics deemed not relevant for the pair of legislators. These result only offer weak evidence that office proximity is more likely to increase agreement when the vote is not relevant for either both or only one legislator in a pair. This evidence weakly indicates that cue-taking might occur through office proximity in votes that are not part to the own legislator's agenda – situations in which they tend to be less informed about the legislation being voted.

A second approach to classify votes according to their relevance follows Saia (2018), which categorizes roll calls based on the intensity of debate (see Table 12). Using speech data, it calculates the average daily number of speeches to establish a threshold, classifying roll calls as non relevant if they do not exceed this threshold. This approach offers limited evidence indicating that roll calls classified as relevant and voted on days with higher debate intensity are more likely to align among legislators in closer office proximity. Days with heightened

debate intensity imply that legislators are likely to be more present in the Chamber as well as in their offices, potentially increasing the likelihood of communication among them.

Table 12: Pair-Level Effects on Voting: Roll Call Relevance Heterogeneity (p.p.)

	Dependent variable: Convergence$_1$	
	Low relevance	Relevant
Office neighbors	0.19	0.72
	(1.0)	(0.7)
Controls	Yes	Yes
Proposal type FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	2,019,460	29,118,074
Outcome Mean	66.1	67.6

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Roll calls relevance are classified based on the intensity of debate. Using speech data, it calculates the average daily number of speeches to establish a threshold, classifying roll calls as non relevant if they do not exceed this threshold. Standard errors are clustered at the legislator individual level. Columns (1)-(2) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *same state*, *ideological distance*, *same gender*, and *age difference*. These variables are self-explanatory. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

5.2.2 Robustness Check: The Remote Congress

Due to social distancing measures introduced to combat the COVID-19 pandemic, the Chamber of Deputies (56th legislature) implemented the SDR, *Sistema de Deliberação Remota*, transitioning all plenary activities—including roll calls—to a remote format and temporarily suspending the functions of permanent committees. This completely remote setup lasted from March 17, 2020 until February 11, 2021, when a hybrid model was introduced, allowing legislators to return to in-person plenary sessions and resuming committee activities. This hybrid system remained in place until October 25, 2021, when normal operations resumed. Briefly in 2022, from the start of the legislative year in February until April 18, the Chamber reinstated the SDR.

Objectively, while the SDR maintained the legislative workflow, it imposed tighter time frames and limited opportunities for extended debate, raising concerns about transparency and thoroughness in policy making (Santos et al., 2021). The congressional agenda under the SDR focused on a range of urgent pandemic-related issues, including public health measures,

economic relief packages, emergency funding for healthcare systems, social assistance for vulnerable populations, and regulations to support remote work and education. The agenda also included policies to stabilize the economy, such as financial aid for businesses, unemployment support, and amendments to labor laws, addressing the immediate needs and challenges posed by the COVID-19 crisis.

The period under the SDR allows me to perform a counterfactual exercise. To make this robustness test, I ran the same specifications (Tables 13 and 14) but using the subset of data related to the period the Congress was operating in a completely remote way. Therefore, the spatial interactions that used to happen were no longer possible, both at the Annexes and at the committees. Holding the hypothesis that spatial proximity effects would not hold in the absence of physical interactions, I expect to find smaller and statistically nonsignificant results on both models.

Table 13: Pair-Level Effects on Voting: Result Margin Heterogeneity (p.p)

	Dependent variable: Convergence	
	$> 5\%$	$< 5\%$
Office neighbors	-0.44	0.2
	(0.8)	(1.0)
Controls	Yes	Yes
Voting type FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	14,909,164	438,190
Number of roll calls	1,359	36
Outcome Mean	69.1	49.7

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Convergence is an indicator of whether the pair of legislators agreed in the proposal's vote. Office neighbors is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Column (1) reports the proximity effect for roll calls with more than 5 p.p. result margin. Column (2) reports the proximity effect for roll calls with less than 5 p.p. result margin Covariates included are same party, ideological distance, same state, same gender, and age difference. These variables are self-explanatory. *p<0.1; **p<0.05; ***p<0.01

Table 14: Pair-Level Effects on Voting: Interaction of Spatial Proximity and Committee Membership (p.p.)

	Dependent variable: Convergence	
	$> 5\%$	$< 5\%$
Office neighbors	-0.39	0.46
	(0.7)	(1.1)
Committee	0.71	-0.13
	(0.3)	(0.2)
Committee × Office neighbors	-0.32	-1.24
	(0.7)	(2.1)
Controls	Yes	Yes
Voting FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	14,909,164	438,190
Number of roll calls	1,347	36
Outcome Mean	69.1	49.7

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Convergence is an indicator of whether the pair of legislators agreed in the proposal's vote. Office neighbors is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Committee is an indicator of whether one legislator within a pair is member of the committee related to the subject of the roll call being voted. Column (1) reports the proximity effect for roll calls with more than 5 p.p. result margin. Column (2) reports the proximity effect for roll calls with less than 5 p.p. result margin Covariates included are same party, ideological distance, same state, same gender, and age difference. These variables are self-explanatory. *p<0.1; **p<0.05; ***p<0.01

Analysis of votes cast under the SDR shows, on average, a negative point estimate (-0.44 p.p.) for voting convergence associated with sharing a similar location. For contested votes, with a result margin lower than 5 p.p., the impact of office proximity (0.2 p.p.) is 10 times smaller and non longer statistically significant. The effect of committee membership interacted with similar location also changes (-1.24 p.p.) and is non longer statistically significant. Both findings support our hypothesis on the importance of physical interactions in explaining the influence of spatial proximity, also underscoring the importance of keeping the standing committees operational.

5.3 The Impact of Office Proximity on Speeches

This section presents an examination of the impact of proximity on speech behavior. Speech behavior is assessed using a natural language processing technique called document embedding. The similarity in speech, denoted as $\textit{Speech similarity}_{ijt}$, is determined using word frequency vectors, also known as "bag-of-words." This approach involves tallying the frequency of words in each speech, creating a vector representation, and then computing the cosine similarity between the speeches of each pair of legislators $i - j$ in a given legislature t.

Table 15: Pair-Level Effects on Speeches: Main Analysis (p.p.)

	Dependent variable: Speech Similarity		
	All	Order of Business & Small Shift	Small Shift
Office neighbors	0.08	0.21	0.14
	(0.3)	(0.5)	(0.3)
Controls	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes
Observations	435,608	76,860	69,064
Outcome Mean	15.5	16.1	17.6

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Column (1)-(3) report the impact of a pair of legislators belonging to the same office neighborhood on their speech similarity. Column (1) takes in account speeches from the Small Shift, Long Shift, Order of Business, and Parliamentary Communications. Communication. Column (2) takes in account speeches from the Small Shift and the Order of Business. Column (3) only takes in account speeches from the Small Shift. *Cosine Similarity* is taken between the speeches of the respective pair of legislators. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *same state*, *ideological distance*, *same gender* and *age difference*. *p<0.1; **p<0.05; ***p<0.01

Column (1) shows that, on average, legislators in close proximity are more likely to speak similarly in 0.08 percentage points. However, this small effect is not statistically significant at conventional levels (p>0.1).

There are two moments where legislators can intervene in the debates more freely and systematically: a) on the floor, during the Short Shift; and, b) in committees, during the Order of Business, when discussing the policies under consideration. In column (2), which considers speeches from these two moments, the probability increases to 0.21 percentage points, suggesting a stronger positive effect on speech similarity when legislators can freely speak their minds. Nevertheless, similar to column (1), the effect is not statistically significant.

In column (3), focusing solely on speeches from the Small Shift, the coefficient remains positive at 0.0014 but is still not statistically significant.

Overall, while there appears to be a tendency for legislators from the same office neighborhood to have more similar speeches, the point estimates are very small and not statistically significant.

6 Conclusion

The office neighborhood provides an environment that facilitates communication and influence between legislators. Based on this social structure, this paper examined the peer effects of office proximity on legislative behavior, relying on the random allocation of offices in Brazil's Chamber of Deputies to estimate and identify these network effects. By applying this methodology in the analysis of peer effects, this study contributed to the literature on randomization-based research in legislative politics (Rogowski and Sinclair, 2012; Saia, 2018; Harmon et al., 2019; Zelizer, 2019; Darmofal et al., 2023; Alquézar-Yus and Amer-Mestre, 2024; Lowe and Jo, 2024). Although the results indicate that, on average, office proximity has a no statistically significant impact on legislative behavior, empirical evidence shows that this influence becomes significant and stronger in contested votes, a important type of nonprocedural decision. These findings suggest that in such situations, where each vote holds greater importance, legislators' office proximity plays an important role in voting behavior – complementing other sources of influence, whether ideological or nonideological.

This paper also emphasizes the informational role of committees by showing empirical evidence of its influence on disputed decisions. The committee system exists in order to reap the informational gains to the floor as a whole from having subgroups of its members specializing on specific topics. This specialization allows the committees to acquire information about the true consequences of a bill to be considered by the floor. I showed that when one legislator in a pair of legislators is a perceived expert (i.e., he is on the relevant standing committee for the respective roll call), sharing a same office neighborhood significantly increases the influence on vote decisions in contested votes. These findings suggest a potential mechanism of cue-taking where legislators rely on perceived experts – typically standing committee members who reported the measure – to guide their voting decisions, especially when informed decision making is crucial. However, this paper acknowledges limitations in distinguishing between cue-taking through office proximity and other concurrent mechanisms like social pressure. Therefore, future research exploring these potentially mutual mechanisms on exogenous or endogenous legislative networks could provide further insights into this phenomenon. A good example are the two field experiments ran by Zelizer (2019) in a state legislature, in which he offers empirical evidence of cue-taking behavior through the diffusion of a randomly-assigned information treatment across an endogenous legislative network. Furthermore, this empirical evidence is limited to contested votes, as it did not show influence on other alternative measures of voting relevance (a proxy for nonprocedural decisions).

A potential endogeneity issue arises when analyzing voting convergence on subsets of roll calls with narrow result margins (contested votes), as this setting may introduce simultaneity bias. Specifically, legislators' decisions to vote in alignment with their office neighbors may be influenced by the anticipation of a close outcome. In highly contested votes, legislators may be more inclined to consult or be influenced by their peers, knowing that each vote could decisively impact the result. This simultaneity creates a feedback loop: the closeness of the vote encourages peer influence, and the influence itself may, in turn, affect the vote margin. As

a result, any observed voting convergence could reflect both genuine peer effects and strategic alignment in anticipation of a close vote, rather than purely the influence of office proximity. This endogeneity complicates the causal interpretation of peer effects in contested roll calls, as the closeness of the vote is not an exogenous condition but is potentially shaped by the same forces driving voting convergence. Thus, the potential simultaneity bias in contested votes represents a limitation of this study.

Brazil's proportional and open list electoral system, which often leads to majority coalition formation in the legislative, presents an intriguing environment for studying peer effects dynamics. First, this coalition-driven legislative system centralizes influence within the formal structures of party and coalition leadership, where decisions are typically coordinated to maintain legislative support for the executive's agenda. In this context, it is generally expected that legislative behavior align primarily with party and coalition guidelines, as legislators depend on these influences for political resources and career advancement. Given these dynamics, the Chamber of Deputies provides a unique setting to test for alternative sources of influence outside party and coalition structures. If peer effects, such as those generated by office proximity, have a measurable impact on legislators' behavior, it would suggest that interpersonal dynamics play a role beyond the structured guidance of party and coalition leadership. Therefore, this paper's empirical evidences challenge the assumption that party and coalition influence are the sole drivers of legislative behavior in Brazil's Chamber of Deputies, indicating that informal interactions can influence decisions even in a highly coordinated political system.

Other studies have explored similar coalition-based legislative systems, where informal interactions may influence formal decision-making. For instance, Saia (2018) and Lowe and Jo (2024) examined Iceland's parliamentary system, which also relies on coalition politics and centralized party influence. Their findings suggest that even within highly structured environments, informal peer effects can shape legislators' behavior in nuanced ways. Further analysis on different legislative systems, in which majority coalition formation is not the rule, could provide additional evidence to this hypothesis.

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Appendix

A.1 Office Lottery

Figure 8: Drawing for one of the offices

A.2 Office Plans

Figure 9: Office Plan - Annex III

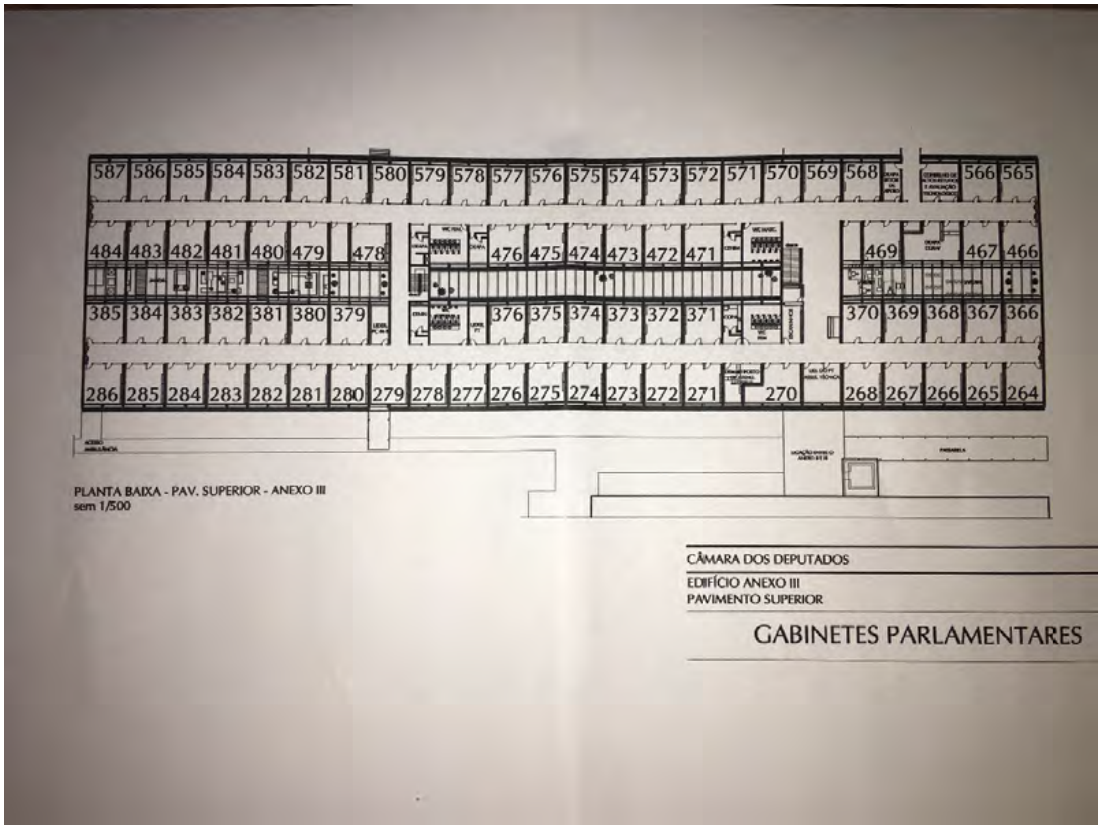
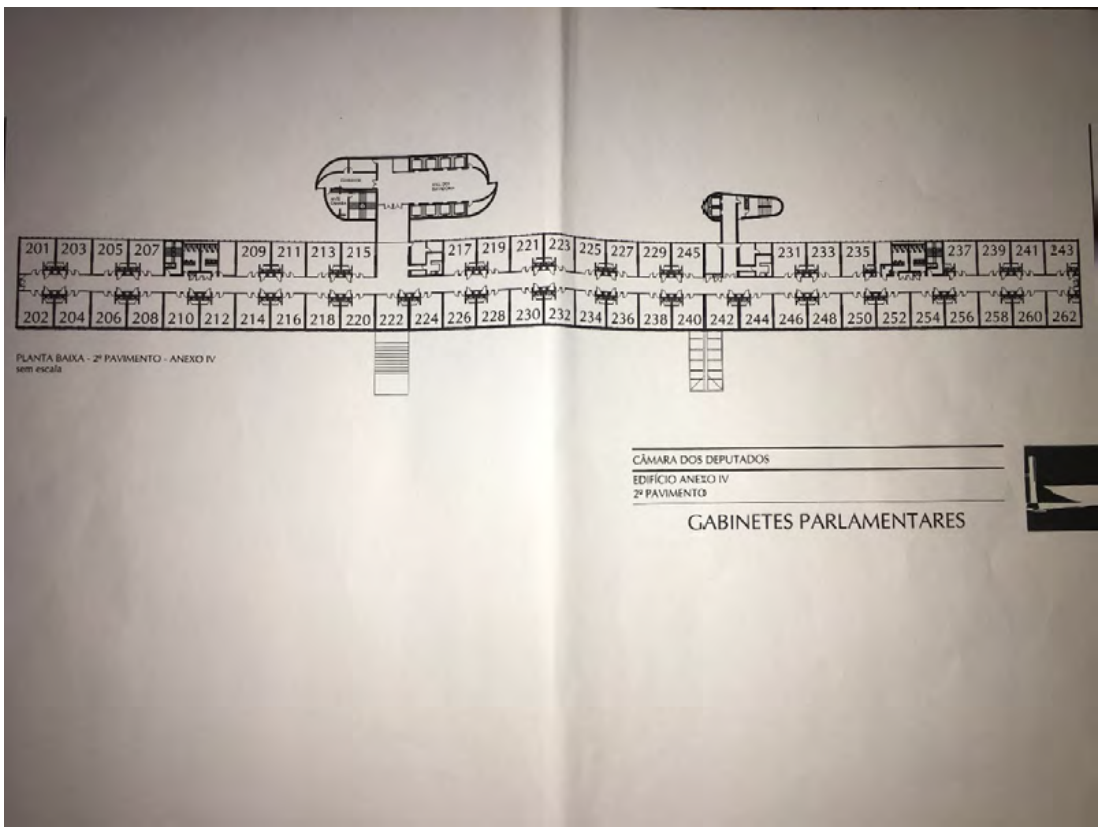


Figure 10: Office Plan - Annex IV



A.3 Types of Legislative Proposals

Projeto de Lei or PL (en. Proposed Law) is a legislative proposal introduced by members of the Chamber of Deputies to create new laws or amend existing ones. PLs cover a wide range of topics, including social policies, economic regulations, and public administration. They undergo a comprehensive legislative process, starting with submission by a legislator, followed by review by relevant committees, debate, and voting in the Chamber of Deputies. Once approved, PLs are forwarded to the Federal Senate for further consideration. Approval of a PL requires a simple majority vote in both chambers of Congress.

Projeto de Decreto Legislativo or PDC (en. Proposed Decree of Congress) are legislative proposals introduced by members of the Chamber of Deputies to regulate matters within the legislative branch's authority. PDCs typically address issues such as ratifying international agreements, approving government acts, or revoking presidential decrees. The process for passing a PDC involves submission, review by relevant committees, debate, and voting in the Chamber of Deputies. Like PLs, PDCs require a simple majority vote in both chambers for approval.

Proposta de Emenda à Constituição or PEC (en. Proposed Constitutional Amendment) aim to modify the Constitution of Brazil, which is the highest legal document in the country. PECs address fundamental principles, rights, and the organization of government institutions. They can be initiated by the President of Brazil, one-third of the members of the Chamber of Deputies, or one-third of the members of the Federal Senate. PECs undergo a rigorous legislative process, including approval by special committees in both chambers, debate, and voting. Approval of a PEC typically requires a supermajority vote (two-thirds of the total number of legislators) in each chamber.

Projeto de Lei Complementar or PLP (en. Proposed Complementary Law) complement existing laws, particularly those established by the Constitution or other primary legislation. PLPs often address specific areas of law that require specialized regulation or provisions. They can be introduced by any member of the Chamber of Deputies. The process for passing a PLP is similar to that of PLs, involving submission, committee review, debate, and voting in both chambers. PLPs may require a higher threshold for approval, such as a qualified majority vote.

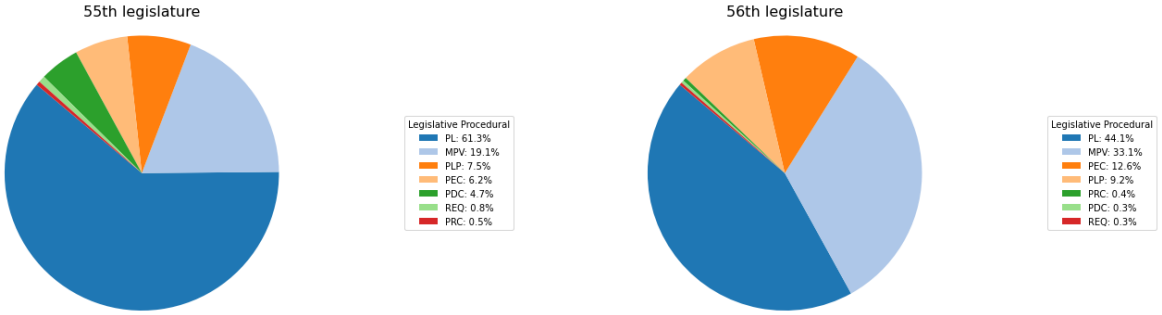
Medida Provisória or MPV (en. Provisional Measure) are legislative decrees issued by the President of Brazil in urgent or exceptional situations. MPVs have the force of law immediately upon issuance but require approval by Congress within a specified period to remain in effect permanently. MPVs are often used to address pressing issues such as economic crises, public health emergencies, or national security concerns. The legislative process for MPVs involves review and approval by both chambers of Congress.

Requerimento or REQ (en. Legislative Inquiry) a proposal, either verbal or written, used to make a request to the President, the Board, or the Plenary. There are various types of important requests presented by Deputies. Some examples include: request for roll call voting; urgency requests; request for the summoning of a Minister of State; request for the inclusion of out-of-agenda items; request for the creation of a parliamentary inquiry commission (CPI).

[FIX]

Projeto de Resolução or PRC (en. Resolution Project) is used to regulate matters within the exclusive competence of the Chamber of Deputies and also for the Chamber to address issues within its jurisdiction, such as the loss of a legislator's mandate. The Resolution Project is deliberated only in the Chamber and is not subject to the President of the Republic's sanction. An approved Resolution Project becomes a Chamber Resolution.

Figure 11: Distribution of Votes - 55th and 56th legislatures



A.4 Convergence$_2$

Table 16: Summary Statistics

	Convergence$_2$ (Yes, No, Abstain and Absences)				
Variable	Mean	St.Dev.	Minimum	Maximum	N
Convergence$_2$	0.433	0.495	0	1	99,410,565
Office neighbors$_1$	0.0077	0.087	0	1	99,410,565
Same party	0.0607	0.238	0	1	99,410,565
Same coalition	0.599	0.489	0	1	99,410,565
Same state	0.0649	0.246	0	1	99,410,565
Same gender	0.928	0.257	0	1	99,410,565
Age diff.	13,65	9.85	0	62	99,410,565

Table 17: Pair-Level Effects on Voting: Main Analysis (p.p.)

	Dependent variable: Convergence$_2$	
	(1)	(2)
Office neighbors$_1$	0.27	0.02
	(0.5)	(0.5)
Controls	No	Yes
Proposal type FE	Yes	Yes
Legislature FE	Yes	Yes
Observations	99,410,565	99,410,565
Outcome Mean	43.3	43.3

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Columns (1)-(2) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office Neighbors*$_1$ is an indicator of whether or not a pair of legislators belong to the same office neighborhood defined by taking in account all surrounding offices – if they are located adjacent to each other, either directly next to, in front of, or diagonally across from each other. Control variables are *same party*, *same state*, *same gender* and *age difference*. *p<0.1; **p<0.05; ***p<0.01

Table 18: Pair-Level Effects on Voting: Result Margin Heterogeneity (p.p.)

	Dependent variable: Convergence$_2$				
	$> 10\%$	$< 50\%$	$< 25\%$	$< 10\%$	$< 5\%$
Office neighbors	-0.2	0.4	1.0*	1.2*	1.4*
	(0.5)	(0.6)	(0.5)	(0.6)	(0.8)
Controls	Yes	Yes	Yes	Yes	Yes
Proposal type FE	Yes	Yes	Yes	Yes	Yes
Legislature FE	Yes	Yes	Yes	Yes	Yes
Observations	35,048,688	24,042,371	7,476,884	2,712,067	1,478,644
Outcome Mean	43.6	40.0	36.5	35.4	35.5

Notes: All point estimates are presented in percentage points. Standard errors in parenthesis are two-way cluster-robust. Columns (1)-(5) report the impact of a pair of legislators belonging to the same office neighborhood on their voting agreement in roll calls with different margin of victory/defeat. *Convergence* is an indicator of whether the pair of legislators agreed in the proposal's vote. *Office neighbors* is an indicator of whether or not a pair of legislators belong to the same office neighborhood in a specific legislature. Control variables are *same party*, *ideological distance*, *same state*, *same gender*, and *age difference*. These variables are self-explanatory. $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

A.5 Committee Median Preferences versus Floor Preferences

Figure 12: CCJC

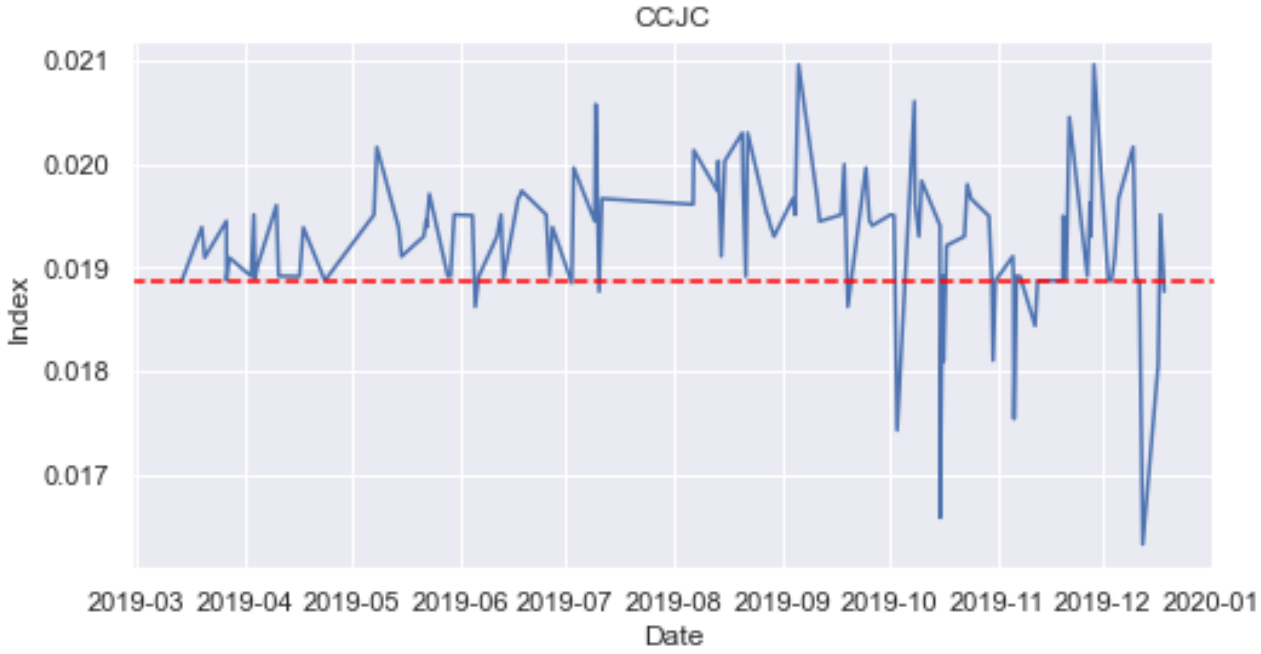


Figure 13: CFT

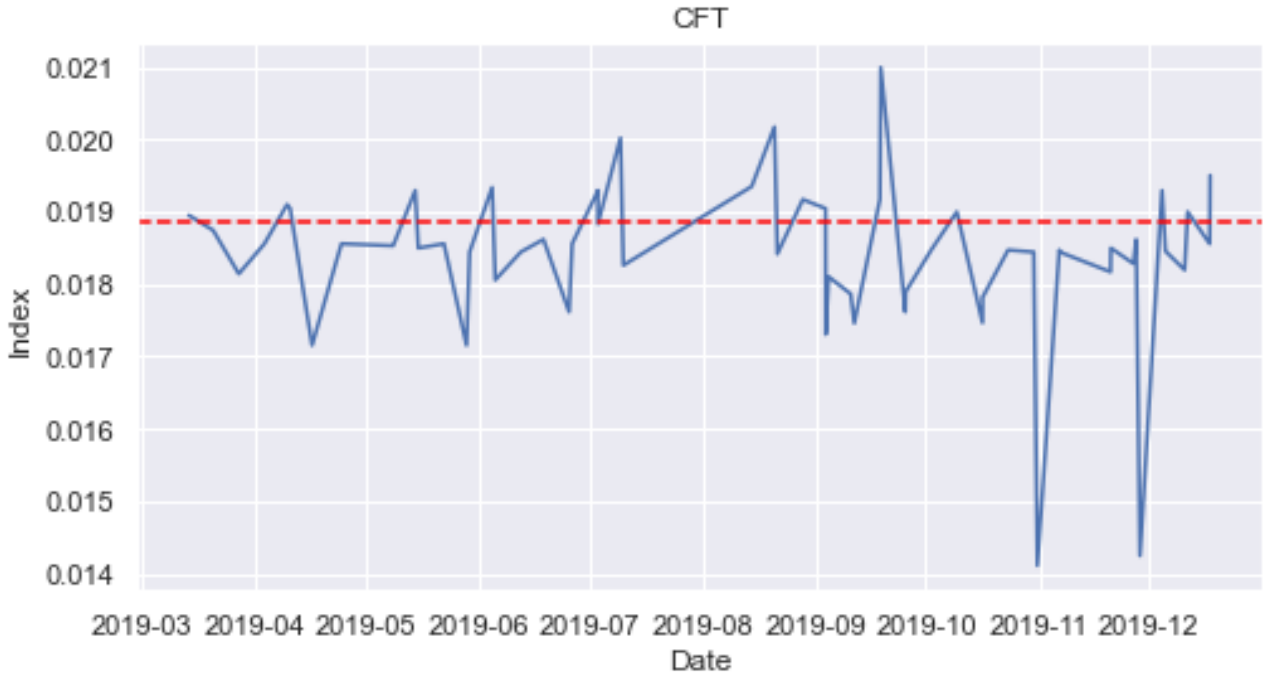
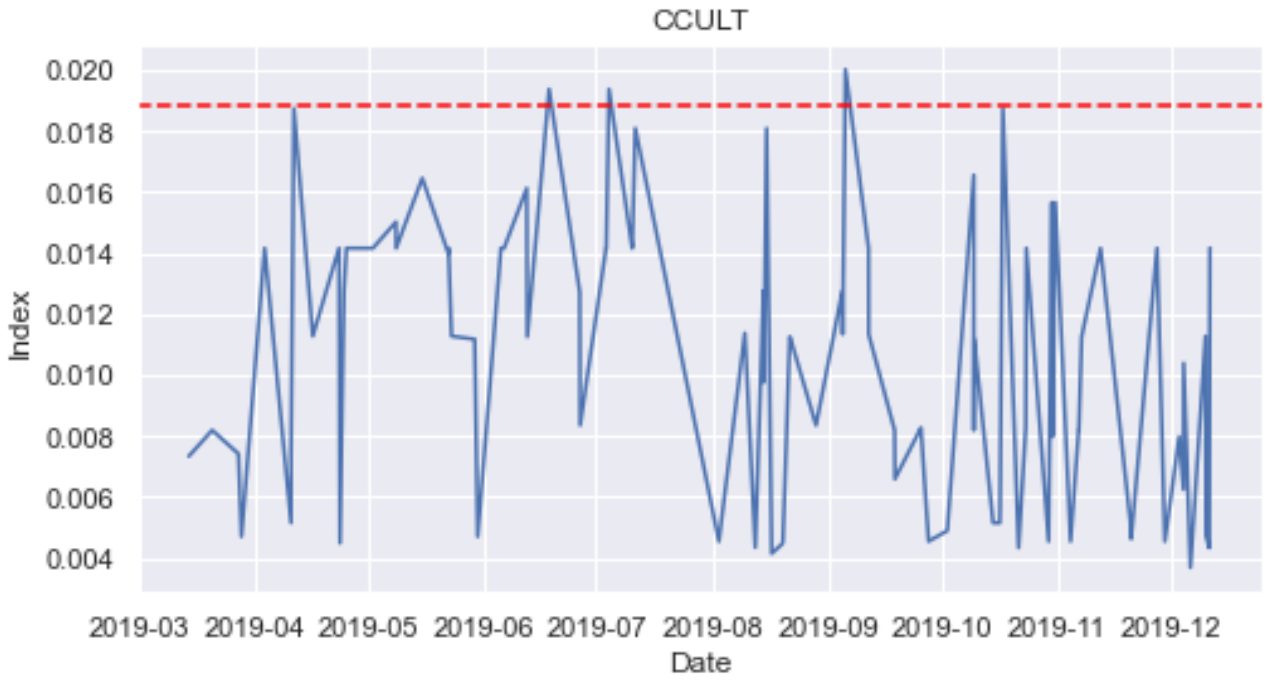


Figure 14: CCULT



A.6 Distribution of Types across the Topics

Topics	MPV	PDC	PDL	PEC	PL	PLP	PRC	**Total**
Public Administration	237	3	4	189	252	121	4	810
Agriculture, Livestock, Fishing, and Extractivism			2			31		68
Art, Culture, and Religion	9			3	18	3	1	35
Cities and Urban Development	35				19			54
Science, Technology, and Innovation	18	1	3	2	14	16		54
Communications	28				10	1		39
Defense and Security	1	4	3	3	55			66
Civil and Procedural Law	1			3	26	4		34
Consumer Rights and Protection	39		1		15			55
Criminal and Procedural Law					38	2		40
Human Rights and Minorities	32	4	1	7	47	15	15	122
Economy	157			23	72	27		279
Education	16	2		25	50	1		94
Energy, Water Resources, and Minerals	47		1	1	17	59	23	148
Sports and Leisure	3				25			28
Land Structure	23				3			26
Public Finance and Budget	60		2	87	44	89		282
Industry, Commerce, and Services					9	4		13
Environment and Sustainable Development	13				34			47
Politics, Parties, and Elections				41	28			69
Social Security and Welfare	39				2			41
Legislative Process and Parliamentary Actions				14			9	24
International Relations and Foreign Trade	9	1	7		3			20
Health	4	2		16	28			50
Labor and Employment	57	1		3	29			90
Transportation and Mobility	40				42			82