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Does cabinet instability matter? Understanding the legislative production of Brazilian ministries

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What explains the legislative production of Brazilian ministries? The article explores the relationship between ministerial instability and the performance of ministries measured by the number of legislative proposals they produced between 1999 and 2014. Using an exponential average model with endogenous regressors, we argue that the change of ministers negatively affects the entities' legislative production. The ideological distance between the minister's and president's parties and the prior legislative expertise of the ministers, have a pronounced impact on the level of legislative production on the government's political agenda. The results corroborate the perception of the negative effect of ministerial instability on the efficiency of the conception and formulation of public policies and contribute to the understanding of legislative production and bureaucratic performance of Brazilian presidentialism.

Keywords: ministries; legislative production; instability; party ideology; presidentialism.

A instabilidade ministerial importa? Compreendendo a produção legislativa dos ministérios no Brasil

O que explica a produção legislativa dos ministérios federais no Brasil? O artigo explora a relação entre a instabilidade ministerial e o desempenho dos ministérios mensurado pela quantidade de propostas legislativas produzidas entre 1999 e 2014. Por meio de um modelo de média exponencial com regressores endógenos, argumentamos que a troca de ministros e ministras afeta negativamente a capacidade de produção legislativa das pastas. Ainda assim, o distanciamento ideológico entre os partidos do ministro e o presidente, bem como a *expertise* legislativa prévia dos ministros, tem impacto mais pronunciado no nível de produção de propostas legislativas dentro da agenda política do governo. Os resultados corroboram a percepção do efeito negativo da instabilidade ministerial na eficiência da concepção e da formulação de políticas públicas, contribuindo para o entendimento da produção legislativa e do desempenho burocrático do presidencialismo brasileiro.

Palavras-chave: ministérios; produção legislativa; instabilidade; ideologia partidária; presidencialismo.

¿Importa la inestabilidad ministerial? Comprendiendo la producción legislativa de los ministerios en Brasil

¿Qué explica la producción legislativa de los ministerios federales en Brasil? El artículo explora la relación entre la inestabilidad ministerial y el desempeño de los ministerios medido por el número de propuestas legislativas producidas entre 1999 y 2014. Utilizando un modelo de promedio exponencial con regresores endógenos, argumentamos que el cambio de ministros afecta negativamente la capacidad de producción legislativa de los ministerios. Aun así, la distancia ideológica entre los partidos del ministro y del presidente, así como la experiencia legislativa previa de los ministros, tienen un impacto más pronunciado en el nivel de producción de propuestas legislativas en la agenda política del gobierno. Los resultados corroboran la percepción del efecto negativo de la inestabilidad ministerial sobre la eficiencia de la concepción y formulación de políticas públicas, además de contribuir a la comprensión de la producción legislativa y desempeño burocrático del presidencialismo brasileño.

Palabras clave: ministerios; producción legislativa; inestabilidad; ideología partidista; presidencialismo.

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1. INTRODUCTION

What explains the level of legislative production of federal ministries? How do the changes of ministers impact the ability of these authorities to formulate bills? Stability in the commands of ministries is assumed to be an intrinsic value, an assumption little tested in the literature on Brazil. We know much more about the factors that influence the choice and survival of the appointed ministers than about the impact of ministerial changes on ministerial performance (Amorim, 2007b; Codato & Franz, 2018; Inácio, 2013; Lopez, M. Bugarin, & K. Bugarin 2014; Loureiro, Abrucio, & Rosa, 1998; Perissinotto, Codato, & Gené, 2020).

This article offers an empirical contribution by analyzing the factors that influence the legislative production of ministries over time, especially the effect of changes of ministers carried out by Brazilian presidents from 1999 to 2014. Ministries are key actors in the federal apparatus in formulating the government's legislative agenda (Rennó & Wojcik, 2015). Thus, the number of legislative proposals they produced in one year was used as a performance indicator.

Based on an exponential averaging model with endogenous regressors, this study seeks to test the effects of ministerial turnover in Brazil on the ministries' ability to present bills to parliament. Also, the research explores the effects of the distance between the ideology of the president's and minister's parties highlighted in the literature on the ministries' legislative production.

The results indicate a negative association between replacing ministers and the ministry's legislative production capacity, offering empirical evidence in favor of administrative stability in the high echelon of the executive branch. Ministers' characteristics and the ideological proximity to the president are elements more strongly associated with the ministry's performance. The greater the ideological distance between the president's and ministers' parties, the lower the ministry's capacity to produce legislation. The ministers' legislative experience – an indicator of the personal dimension – positively affects the ministry's legislative production. Although replacing personnel of the government's first echelon may jeopardize ongoing projects, career civil servants are less likely to be replaced. Thus, stable, and qualified civil service mitigates the negative effects arising from ministerial changes, which gives political and personal variables a more significant weight in the ministries' ability to formulate bills and influence the policy agenda in Brazil.

The article is structured as follows. The next section presents a literature review of factors associated with ministerial legislative production and exposes the hypotheses to be tested. The data and the estimation model are presented and described in the third section. In the fourth section, we discuss the main results of the empirical model. The fifth and final section presents the final considerations.

2. MINISTRIES, POLITICAL INSTABILITY, AND LEGISLATIVE PRODUCTION

The legislative branch in Brazil has a central role in legislative production. The president has an arsenal of formal powers (Amorim, 2007a; Chaisty, Cheeseman, & Power, 2014; Figueiredo & Limongi, 1999; Mello & Pereira, 2013). Despite the centrality of the president's role in the country's political system, legislative proposals by the executive branch are formulated in ministries, and the president most often acts as a gatekeeper of the legislative production process (Palotti & Cavalcanti, 2019).

Recent studies have focused on the ministries' legislative production (Batista, 2013; Rennó & Wojcik, 2015). However, the most significant part of the literature on this topic analyzes appointees to the first echelon in the federal government and the interaction between the legislative and executive branches. These studies emphasize party composition and the formation of coalition governments (Amorim, 2006; Amorim & Samuels, 2011; Bertholini & Pereira, 2017; Chaisty et al., 2014; Praça, Freitas, & Hoepers, 2011; Raile, Pereira, & Power, 2011).

The study of ministries as a unit of analysis and the political and organizational factors that affect their ability to produce laws is an important contribution to understanding the process of formulating the government's legislative agenda. The interaction between government bureaucracies and elected politicians is a recurring source of tension in representative democracies (Bersch, Praça, & Taylor, 2017). The positive, negative, or null effect of cabinet instability on policy formulation and implementation divides the specialized literature, whose production points to divergent explanatory mechanisms in different empirical cases.

The central diagnosis from the perspective of the negative effect of instability concerns the continuity of public policies, arguing a disorganizing effect on the ministries' or agencies' administrative routines and projects (Codato, Perissinoto, Dantas, Franz, & Nunes, 2018; Milio, 2008; Palotti, Cavalcante, & Gomes, 2019). Long-term policies demand a certain level of stability from the government team. High ministerial turnover is an element that deteriorates the efficiency of delegating responsibilities to the bureaucracy. Also, the accumulation of experience of the minister is an essential asset in policy implementation (Cornell, 2014; Stein & Tommasi, 2006).

Information has a crucial role in connecting high ministerial turnover, the difficulty of working with bureaucracy, and the negative effect on the ministries' policy production. Information is usually a monopoly of the top bureaucrats, a phenomenon that can be minimized if the minister stays in office long enough, disinhibiting a possible informational bureaucratic veto to the formulation of a policy (Huber, 1998). For the author, the informational problems between ministers and bureaucrats in the context of high ministerial turnover can also be observed in the strategic relationships between ministries and interest groups, increasing monitoring costs.

Comparative studies of Latin American countries show that cabinet instability negatively affects fiscal balance (Amorim & Borsani, 2004) and can harm inter-ministerial coordination and the possibility of long-term transactions (Matríguez-Gallardo, 2010). The study by Akhtari, Moreira, and Trucco (2017) in Brazil indicated a worse performance in municipal education in administrations with higher turnover in the local bureaucracy. Few studies focus on the effects of cabinet instability on public policies in Brazil, especially in the economic area, with more studies focused on the choices and duration of ministers in office.

Cabinet instability is often assumed to be intrinsically valuable, ruling out the need for empirical verification (Goldsmith, 1987). The literature contests this perception, arguing that a replacement is not always negative, often serves as a presidential mechanism to overcome political crises, institutional limitations, correcting unwanted directions (Franz & Codato, 2018; Martínez-Gallardo, 2014).

Mesquita (2000) builds an even more emphatic argument: ministerial turnover prevents a party or politician from dominating a specific public administration area and helps avoid the consolidation of patronage. The longer ministers stay in office, the higher their chances of engaging in actions of personal favor, reflecting institutional arrangements that encourage corruption and anachronism (Praça et al., 2012). Loureiro and Abrucio (1999), when analyzing the Brazilian Ministry of Finance, demonstrated significant bureaucratic insulation concerning a ministerial replacement for political purposes, pointing out the absence of negative effects when replacing the minister in charge of the economic policy.

Although the permanence of ministers increases the probability of the permanence of high-ranking officials (in Brazil, positions known as DAS 5 and 6), the chance of career civil servants staying in high-ranking positions is 30% higher than appointed professionals (Lopes & Silva, 2020). Thus, ministries with a higher proportion of career civil servants in high-ranking positions – as observed in the Brazilian Ministry of Finance – are more likely to mitigate negative effects arising from cabinet instability.

The negative effect of cabinet instability is still inconclusive in studies on the Brazilian executive branch. The main hypothesis of this research emerges in this context, assuming that the minister's turnover negatively affects the ministries' legislative production.

The multi-party system observed in Brazil presents strong incentives to form coalition governments, a practice that involves distributing the power over ministries among the allied parties. Against this backdrop, the ministries' legislative production can be affected by the degree of the allied parties' ideological heterogeneity, slowing down the cabinet's legislative production (Bräuninger, Debus, & Wüst, 2015; Martin & Vanberg, 2014). Batista (2013) argues that ministers cannot be seen as the president's employees but as authorities with political preferences and their own electoral projects. The author demonstrates that the greater the ideological distance between the minister's party and the president's party, the greater the probability of centralizing the bills produced by the executive branch in the president's hands, which means a decrease of ministries' legislative production (Batista, 2013).

Ministers from the same party as the president, or ideologically convergent with the president, tend to present a more active behavior in proposing bills, often receiving preferential treatment and greater protection from the presidency (Araújo, Costa, & Fitipaldi, 2016; Dewan & Myatt, 2007). An example of this protection can be found in the study by Palotti et al. (2019). They demonstrated that Brazilian ministers whose parties have an ideology distant from the president party are less likely to remain in government in the face of media scandals.

Ministers close to the president are seen with greater trust and benefit from a greater presidential delegation, allowing an active role in shaping the government agenda and, consequently, legislative production (Rennó & Wojcik, 2015). Ministers far from the president's circle tend to invest in the legitimacy of their agenda, needing to build collective support for their legislative proposals, making their production difficult (Rennó & Wojcik, 2015). Due to this perception in the literature on Brazil,

we formulated the second hypothesis of the study: the greater the ideological distance between the minister's and the president's parties, the lower the ministry's legislative production.

Important control variables affecting the ministries' legislative production were considered for this study, based on the literature. The first is the previous political and administrative experience of ministers is a personal characteristic commonly used in the literature to understand ministers stay in the position, postulating a positive relationship between experience and the durability of the position (Camerlo, 2013; Chasquetti, Buquet, & Cardarello, 2013; González-Bustamante & Olivares, 2016; Huber & Martinez-Gallardo, 2004; Muller, 2000).

In the specific case of ministries' legislation production, it is possible to expect a positive effect of the ministers' experience on their office's level of legislative activity (especially if the minister has legislative experience). Politically savvy ministers may have an advantage in organizing legislative support and more efficiently anticipate the median preference of legislative houses, submitting bills more often.

The second control variable concerns the size and importance of the ministry in the federal structure – and there are significant differences throughout the cabinet (Batista & Lopez, 2021; Rennó & Wojcik, 2015). It is expected that the more important the ministry, the greater the number of meetings with the president and the ability to produce bills. The ministry's annual budget and the number of DAS positions allocated in the office are good indicators to assess the ministry's size (Batista, 2017). Also, a positive relationship is expected between the ministries budget and the number of DAS positions, and the legislative production.

The third control variable refers to the public opinion of the relevance of the issues under the ministry's responsibility, a factor that can put pressure on the ministry to improve performance (Vigoda, 2002). Fortunato, Lin, Stevenson, and Tromborg (2020) argue that many voters can infer the influence of parties on policymaking in multiparty governments through informative cues, sustaining the electoral connection between government sectors (such as ministries) and public opinion. Thus, it is expected that public opinion of the country's main problems under the responsibility of ministries can encourage them to produce more bills to respond to electoral demand.

The fourth and final control variable is the representativeness of the ministers' political party in the Chamber of Deputies. According to Amorim (2006), the president prepares the negotiation strategy with the National Congress based on the type of legislative agenda to be implemented. A legislative agenda that needs congressional approval through bills and constitutional amendments requires high partisanship and coalescence in the government's composition. Thus, ministers from parties with more legislative seats are expected to present a more significant legislative production.

One aspect that will not be controlled in this study is the relevance of the legislation's subject. Depending on the magnitude of the bill, only one legislation passed may be enough to satisfy voters and supporters. However, it is important to assess not only the number of bills a ministry proposes but their quality. This factor should be explored in a more qualitative research design.

The next section presents the data collected and the methodology adopted to test the hypotheses.

3. DATA AND METHOD

The data are organized in an unbalanced panel, with cross-sectional units equivalent to the ministries and temporal units equivalent to the years 1999 to 2014. The panel is unbalanced because some ministries, such as the Ministry of Fisheries and Tourism, were created after the start of the sample period. The dependent variable of this study is the annual number of bills presented by the federal ministries, covering four presidential terms. The frequency of bills reveals the ministries' legislative production.

Data were obtained from Batista (2017) and included bills (PL), constitutional amendment bills (PEC), provisional measures (MPV), and complementary bills (PLP), all submitted to the National Congress, regardless of the final result: approved, rejected, or in process. When more than one ministry signs the same bill, the data is computed for all signatories for that year. Thus, ministries' performance is empirically instrumentalized by the number of bills sent to parliament, constituting a measure of central productivity in formulating a government policy agenda. The variable was called "legislative production."

The sample time series covers four presidential terms whose presidents obtained majority support in the National Congress in most of the years. As Figueiredo and Limongi (2009) argued, the fusion of powers in Brazilian presidentialism also implies a fusion of agendas, suggesting that the coalition structures the government policy agenda. Thus, when selecting terms in which presidents held majority support in Congress (Figueiredo, Canello, & Vieira, 2012), we compared ministries' performance in similar contexts, isolating possible effects of inhibition of legislative production due to relations with parliament.

The main independent variable is whether there was a change of ministers in a given year for each ministry in the period analyzed. It is a dichotomous variable where the change of ministers is 1, and the maintenance of ministers is 0. Data were obtained from Franz and Codato (2016), encompassing all Brazilian ministries between 1999 and 2010. We updated the data to include the first term of President Dilma Rousseff (2011-2014), following the same pattern as Franz and Codato (2016). The dichotomization of this variable brings little harm in terms of information reduction since only 4.2% of the analyzed cases had more than one ministerial change in the same year (or three ministers). Thus, with the annual time series, the dichotomous variable satisfactorily accounts for the degree of change in the position. This variable was called "change of minister."

The second independent variable of the study is the ideological distance between the president's party and the ministers' party, structured as a scale. Once again, we use the database built by Batista (2017), which estimates ideal points based on a survey applied to legislators to determine the ideological distance between the president's and the ministers' parties, subtracting the ideological position of the former in relation to the latter¹. We named this variable "ideological distance."

Regarding the control variables, the minister's political experience was coded dichotomously. We assigned 1 for ministers who previously held elected positions (in the executive or the legislative

¹ For more details, see Batista (2013, pp. 462-463).

branch), denoting their political experience. Those who had never held elective positions before taking office as ministers were assigned 0. The variable was called “legislative experience.”

The ministries’ budget and DAS-type positions were obtained from the database put together by Batista (2017). The annual budget was standardized, while the absolute annual frequency of DAS positions (high-ranking positions in the structure of ministries) that each ministry had was disaggregated by functional category from 1 to 6. The variables were named “ministry budget” and “DAS,” respectively. The perception of public opinion on the importance of ministries was obtained annually through the available data from the Latinobarometer, from which we collected responses referring to the country’s main problem. Each one was directed to the responsible ministry (healthcare to the Ministry of Health, schooling to the Ministry of Education, unemployment to the Ministry of Labor, and so on).

We constructed a variable that measured the percentage of Brazilians who consider the problems of each ministry the most important for the country in each year of the study sample, which we named “public opinion.” Finally, the number of legislative seats supporting the executive branch’s policies was extracted from Batista’s database (2017) and established as the percentage of seats the minister’s party held that year in the Chamber of Deputies. The average was used when more than one minister from different parties was observed ahead of a ministry in the same year. We called this variable “legislative seats.” Table 1 shows the variables with descriptive statistics for 324 sample observations.

TABLE 1 DESCRIPTIVE STATISTICS

Variables	Average	Stand. dev.	Min	Max
Legislative production	6.9	9.81	0	58
Change of minister	0.41	0.49	0	1
Ideological distance	0.18	0.30	0	1.18
Legislative experience	0.57	0.50	0	1
DAS	813.05	573.98	123	2684
Ministry budget	0.48	0.20	0	1
Public opinion	4.14	8.98	0	48
Legislative seats	25.25	9.00	3.98	41.74

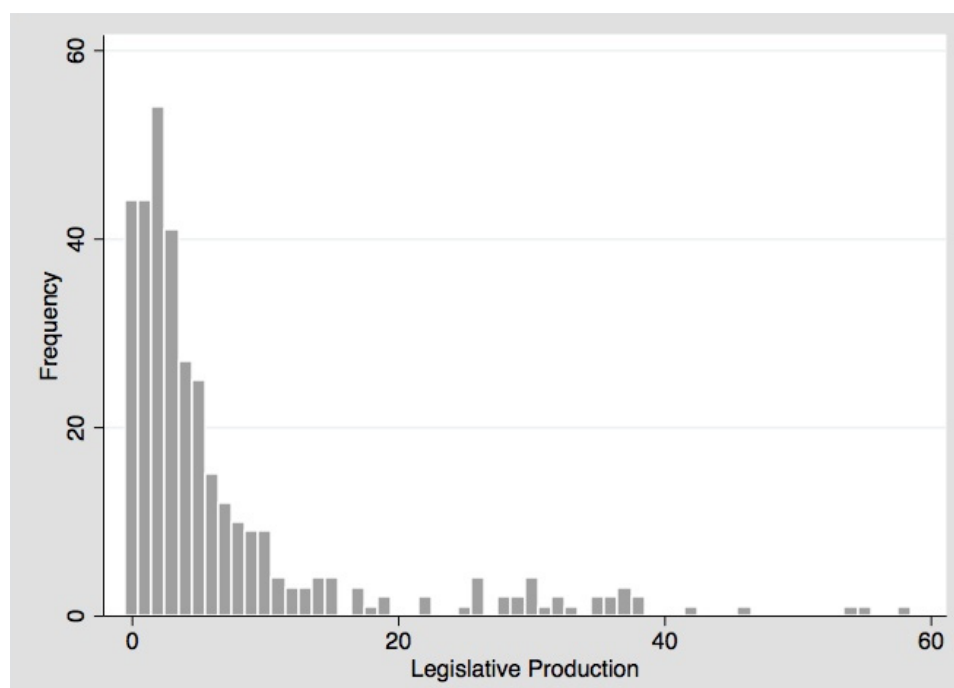
Source: Elaborated by the authors based on data from Batista (2017) and Franz and Codato (2016).

The legislative production of ministries varied significantly. Some ministries did not send a single bill in an entire year, whereas others sent more than ten, with an average of almost seven bills per year. Just under half (41%) of the ministers were replaced in one year, and the ideological distance between the ministries’ parties and the president’s party was small on average, ranging from zero (same party as the president) to 1.18. Just over half (57%) of the ministers had prior legislative experience. The average number of DAS positions (considering the six levels) in ministries was 813, with significant

variation across ministries of different sizes. The same goes for the ministry budget, with an average of 0.48 in the standardized measure. The average percentage of public opinion that points to the ministry's area of responsibility as the country's main issue was 4.14%, with high variability in ministries (some with zero and others with 48%). The percentage of legislative seats held by the minister's party in a given year varied widely, from 3.9% to 41.7% (25% average).

The method used to test the research hypotheses is presented below. The statistical model was chosen based on essential characteristics of the ministries' legislative production and their relationship with the ideological distance and the change of ministers. Before introducing the method, Graph 1 shows the distribution of the dependent variable.

GRAPH 1 FREQUENCY DISTRIBUTION OF LEGISLATIVE PRODUCTION



Source: Elaborated by the authors based on data from Batista (2017).

As observed above, there is a very asymmetric distribution: out of 324, 43 observations assume the null value. Although the average value is equivalent to 6.9, the median is 3.0, indicating a high concentration of data close to zero. This is the first relevant characteristic of ministries' legislative production behavior.

The high number of zeros suggests that the process that generates zeros may differ from the processes generating the other values observed for the dependent variable. We can model two zero-generating processes. Firstly, zeros were generated because some ministries did not present bills (which may be explained by the area these ministries operate – they may not need further legislation to put forward the activities). These cases are the excess zeros of the model, and they probably cannot

be explained by the same model used to interpret the non-null number of bills. Secondly, zeros were generated based on the ministries' choice of avoiding introducing a bill in scenarios of adverse political conditions – which may explain strictly positive variations in the number of bills when such conditions change. In this second process, the zeros could be explained by the same model adopted to interpret the other values assumed by the dependent variable.

The conditional average of “legislative production” varies according to the ideological distance between the president's party and the ministers' parties. When they are equivalent, or the ideological distance is null, the average number of bills is 9; when the distance is greater than 0.5, the average decreases to 2.4. Thus, ideological distance is a potential predictive factor for legislative production. Likewise, the conditional average of bills is lower when there is a change of minister. However, the drop is not as sharp in relation to the one that characterizes the increase in ideological distance – the number of annual bills when there is no change of ministers is 7.4, dropping to 6.1 when there is change. The results indicate that the data is adequate to test the study's two central hypotheses.

Furthermore, the conditional variance of “legislative production” is substantially higher than the variable's conditional mean, both when the variable is conditioned to ideological distance and to change of minister. For example, when the variable is conditioned to ideological distance, the average conditional variance is approximately eleven times the value of the conditional mean. The statistical model for understanding the legislative production must consider the dependent variable's statistical properties, summarized by values in the set of natural numbers, asymmetrical frequency distribution, and possible overdispersion evidenced by high conditional variances.

The negative binomial regression model, like Poisson's, is ideal for modeling dependent variables that take on values expressed in natural numbers. Furthermore, the Poisson model assumes that the dependent variable has a mean equivalent to its conditional variance. The negative binomial regression assumes a generating process similar to the first one. However, it is more flexible, as it allows the values of conditional mean and variance to be different by estimating an additional parameter to measure overdispersion.

The zero-inflated negative binomial model makes it possible to combine a logit model with the negative binomial model to explain the excess zeros. We can use a logit model to estimate the probabilities of each zero belonging to one of two generating processes: choice for the absence of bills, which follows a negative binomial model, and the other values of the dependent variable, or zeros in excess. The following equation illustrates the zero-inflated negative binomial model:

$$E(Bills) = P(Excess Zero) * 0 + P(Non Excess Zero) * E_c(Bills)$$

In the equation above, $E(Bills)$ represents the expected number of bills, while the terms on the right are defined as follows: $P(Excess Zero)$ equals the probability of the presence of excess zeros; $P(Non Excess Zero)$ is equivalent to the probability of absence of excess zeros, equivalent to $1 - P(Excess Zero)$; is equivalent to the expected number of bills conditioned to the absence of excess zero, following a negative binomial model:

$$E_c(Bills) = E(e^{BX+e})$$

$B = (b_0 \ b_1 \dots b_n)$, $X = (1 \ x_1 \dots x_n)'$ are, respectively, the vectors of the parameters and the vectors of the explanatory variables of the model: change of minister, ideological distance, legislative experience, ministry budget, public opinion, legislative seats, and DAS positions by functional category (1 to 6). The error term is represented by e .

Note that the representation of $E_c(Bills)$ in the negative binomial model is equivalent to the representation provided by the Poisson model. However, the first allows the conditional variance of the number of bills to be higher than the variable's conditional average.

In the zero-inflated negative binomial model, the presence of excess zeros follows a binary logit model in which the probability of the presence of excess zeros is modeled as a function of possible determining factors. The negative binomial distribution is used to model the number of bills conditioned by the absence of excess zeros.

Table 2 shows that some ministries, possibly due to the area in which they operate, are more likely not to present bills to the parliament, such as Fisheries, which did not present any bill in the five periods of operation (2010 to 2014), and Tourism, which only presented bills in 2003 and 2008. Furthermore, the conditional average of the standardized budget for sample observations with at least one bill is 0.50 and 0.35 for sample observations without bills. Thus, the presence of excess zeros may be associated with the reduced size of some ministries, captured here by the variable ministry budget or the total number of DAS positions.

TABLE 2 LACK OF BILLS PER MINISTRY

Ministry	Periods with no bills presented	Periods with data available for each ministry of the sample	Ministry	Periods with no bills presented	Periods with data available for each ministry of the sample
Agriculture	1	16	Nat. Integration	3	16
Cities	1	11	Justice	0	16
Science	3	16	Environment	2	16
Communications	3	16	Mining/Energy	0	16
Culture	3	8	Planning	0	16
Defense	1	16	Social Security	0	16
Rural develop.	2	14	Foreign affairs	2	16
Social develop.	0	10	Health	1	16
Education	1	16	Work	0	16
Sport	4	16	Transport	2	16
Finance	0	16	Tourism	10	12
Industrial	0	16	Fisheries	5	5

Source: Elaborated by the authors.

In view of the potential dependence of excess zeros arising from conditions intrinsic to each ministry in the zero-inflated negative binomial type models, we assume that, in $P(\text{Excess Zero})$, the probability of the presence of excess zero is a function, in addition to the variable ‘ministry budget,’ fixed-effect binary variables per ministry. These variables identify characteristics of each ministry that are constant over time (such as the area of activity) that may cause the absence of bills.

4. RESULTS

Table 3 presents the average marginal effects resulting from the estimation of the negative binomial model in columns A and B and the zero-inflated negative binomial model in columns C, D, and E. The marginal effects were calculated as the first derivative related to each continuous variable in the left column: ideological distance, ministry budget, public opinion, and legislative seats. For the discrete variables, change of minister and legislative experience, the marginal effects were calculated as the first discrete difference in the value of the dependent variable in relation to the base category.

The reported marginal effects are average, as they are assessed for the values of the variables of each observation, and the arithmetic mean of the marginal effects is reported. The models were computed with fixed effect control per ministry and with control for the number of DAS positions for each category (1 to 6), which, taken together, are statistically significant in all models.

TABLE 3 **NEGATIVE BINOMIAL MODEL**

	Average marginal effects				
	Negative binomial		Inflated negative binomial		
	A	B	C	D	E
Change of minister	-1.01 (0.49)**	-0.97 (0.47)***	-0.97 (0.47)***	-0.98 (0.46)***	-1.04 (0.47)***
Ideological distance	-4.10 (1.35)***	-4.10 (1.18)***	-4.91 (1.30)***	-4.88 (1.20)***	-4.08 (1.30)***
Legislative experience	1.51 (0.59)***	1.56 (0.58)***	1.51 (0.58)***	1.54 (0.57)***	1.97 (0.56)***
Ministry Budget	5.37 (5.19)	No	0.99 (0.40)***	0.96 (0.40)***	1.40 (0.47)**
Public opinion	0.03 (0.06)	No	0.02 (0.06)	No	No
Legislative seats	0.00 (0.04)	No	-0.02 (0.04)	No	No
Fixed effect control	Yes	Yes	Yes	Yes	Yes
Control DAS 1 to 6	Yes	Yes	Yes	Yes	Yes
Cragg & Uhler's R ² :	0.75	0.75	0.77	0.77	0.77
LR Test	96.59 0.00***	98.41 0.00***	72.76 0.00***	72.58 0.00***	50.94 0.00***
Vuong Test			2.67 0.00***	2.66 0.00***	2.59 0.00***
Obs.:	347	352	347	348	324

Notes: The table presents each variable's marginal effect and the respective robust standard error in brackets, calculated by the delta method.

** Statistically significant at the 5% significance level.

*** Statistically significant at the 1% significance level.

Source: Elaborated by the authors.

We have the negative binomial model in column A of Table 3, including all explanatory variables considered in this study. In column B, we have the binomial model after excluding the variables that proved to be statistically insignificant in column A. In column C, we have the zero-inflated negative binomial model, including all explanatory variables and containing the binaries by ministry and budget to explain the probability that the zero belongs to one of its two generating processes. In column D, there is the exclusion of insignificant explanatory variables in column C². In column E, we have the same zero-inflated negative binomial model as in column D, but with the replacement of the variable “ministry budget” and “DAS positions” (categories 1 to 6) for their first lags.

Because a greater potential for legislative production can increase the hiring of personnel or the ministries budget, the research adopted the lag in the budget related to DAS positions (categories 1 to 6) to mitigate marginal effects bias due to probable endogeneity of explanatory variables.

The last rows of the table report the likelihood-ratio test (LR test) for the alpha parameter, which allows overdispersion modeling in the negative binomial model, in addition to the Vuong test, for the zero-inflated negative binomial model. The table shows the test statistic for each model and its corresponding p-value reported below the test statistic.

The LR test is about the statistical relevance of the overdispersion parameter estimated in the negative binomial model. When the test indicates a statistical relevance of the parameter, there is evidence leading to choosing the negative binomial model over the Poisson model – which does not allow the modeling of overdispersion. The Vuong test verifies if the presence of two zero-generating processes has statistical relevance to explain the model or if the negative binomial model of a single equation would better represent the data.

In all estimated models, the LR tests statistics and the corresponding p-values equivalent to zero show robust evidence of overdispersion when rounded to the second decimal place, leading us to choose the negative binomial model over the Poisson model. The Vuong test shows that the negative binomial model better represents the data in all the estimated inflated models (columns C, D, and E) when it allows inflated zeros.

Legislative experience increases while the change of minister and ideological distance significantly reduce the number of bills across all estimated models. The change of minister (i.e., this variable’s variation from 0 to 1 or approximately two standard deviations) is associated with the approximate drop of one bill, or 15% of the average sample value of bills, of 6.9 per year, in all estimated models.

The increase of 0.58 in the ideological distance between the ministers’ and the president’s parties (which corresponds to an increase of two standard deviations of the variable) is associated with an approximate decrease of 2.37 (0.58 multiplied by 4.08) bills or 34% of the average sample value of

² The average marginal effects of the non-zero-inflated negative binomial model were estimated to verify whether the results were robust. The two ministries with the highest proportion of zeros (Fisheries and Tourism) were excluded, so most of the excess zeros were left out. The results are similar to those presented in columns C and D of Table 3 and are available upon request from the authors.

initiatives in the model of column E, taking into account the possible endogeneity of the regressors. In this model, the presence of the minister's legislative experience (i.e., this variable's variation from 0 to 1 or approximately two standard deviations) is associated with an approximate increase of 1.97 bills or 29% of the average sample value of the bills. All estimated models have similar marginal effects and explanatory power, as shown by Cragg and Uhler's R-squared.

The reduction of the ideological distance between the ministers' and the president's parties has a greater positive impact on the ministries' legislative production, with slightly higher than twice the magnitude of the positive impact caused by the absence of a change of ministers. In contrast, the legislative experience has a positive impact of a slightly smaller magnitude than that of the ideological distance.

The average marginal effects of the Poisson regression using the maximum likelihood method (columns A, B, and C) and of the linear regression by the ordinary least squares method (columns E and F) were reported (Table A1, Appendix) to verify if the estimation results are robust. In models B and C, the statistically insignificant variables of model A were removed. In addition, model C of this table presents the results of the Poisson model, excluding the extremes of the bills distribution tails that correspond to null values or greater than twenty bills per year (10% of the upper and lower tails).

Columns A, B, and C of Table A1 show that the impacts are similar to those in Table 3. However, the Poisson model does not consider the high conditional variance and the excess zeros of the dependent variable.

The impacts of the linear ordinary least squares (OLS) estimator are presented in columns E and F of Table A1. In the model in column F, the statistically insignificant variables in column E were removed. The OLS estimator does not consider the null lower bound of the dependent variable, nor does it respect the assumption of the discrete distribution of the dependent random variable. However, the Poisson and ordinary least squares linear models generate effects of similar magnitudes, with some within the 95% confidence interval of the zero-inflated negative binomial estimator, with lower statistical significance only for the variable legislative experience, significant at the same time at a level of 5% and 10%, by the Poisson and ordinary least squares models, respectively.

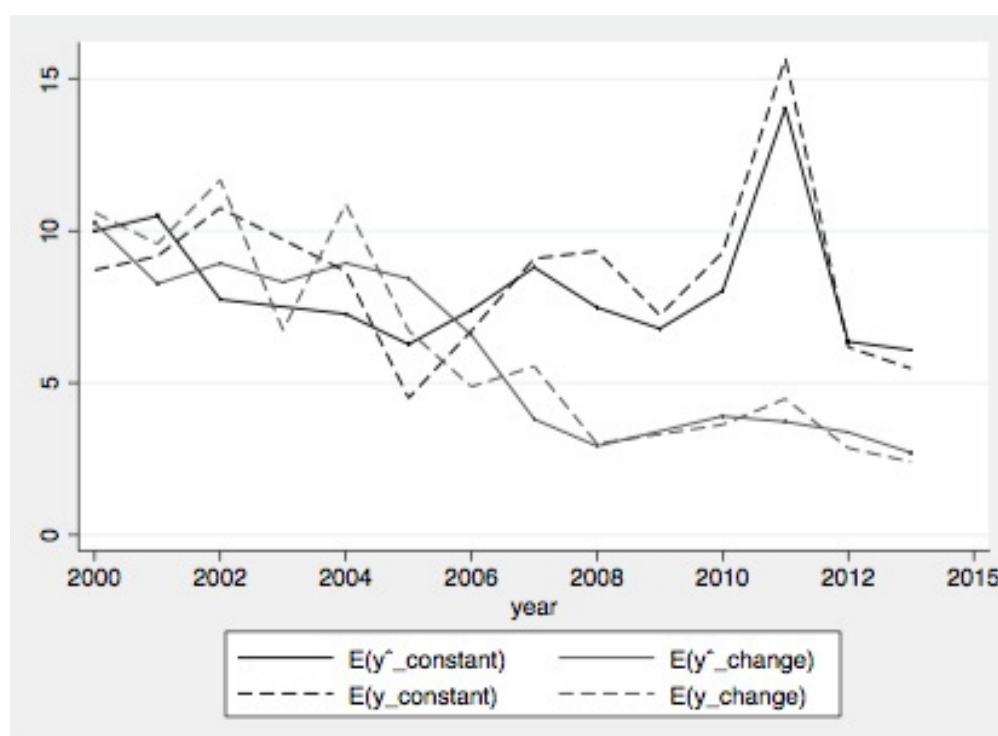
Since a smaller number of bills can also lead to the change of minister, the Column C of Table A1, presents the impacts of the Poisson model estimated by the generalized method of moments, with instrumental variables for the variable change of minister (model IV Poisson). Despite the possible reverse causality between the two variables when considered in the same period, possibly the number of legislative initiatives in a given period does not cause the change of ministers in previous periods. Thus, the set of instrumental variables considered is given by the first lag of the variable "change of minister," in addition to the first lag of the other explanatory variables – ideological distance, legislative experience, number of DAS positions, and ministry budget.

The use of lags of explanatory variables as instrumental variables has been around for a long time and led to the development of estimators capable of mitigating the endogeneity of explanatory variables (Arellano & Bond, 1991). The results in Column C of Table A1 show that the possible endogeneity of the variable "change of ministers" can cause a bias to reduce the absolute magnitude of its effect on

the number of bills, with the change of ministers causing about twice the negative effect originally pointed out by any of the negative binomial models presented in Table 3.³

Graph 2 shows the time evolution of the annual average value of the number of bills and the expected number of bills for the group of ministries that were subject to the change of minister – series in gray ‘ $E(y_change)$ ’ and ‘ $E(\hat{y_change})$ ’, respectively – as well as for the group that was not subject to change of minister – series in black ‘ $E(y_constant)$ ’ and ‘ $E(\hat{y_constant})$ ’, respectively. The averages were computed year by year for the group of ministries that changed minister each year and the one that did not, separately. The expected number of bills was generated by the zero-inflated negative binomial model, which uses the first lag of the ministry budget and the lag in the number of DAS positions to control the possible endogeneity of these variables (column E of Table 3).

GRAPH 2 AVERAGE NUMBER OF BILLS OBSERVED AND ESTIMATED, DEPENDING ON THE CHANGE OF MINISTER



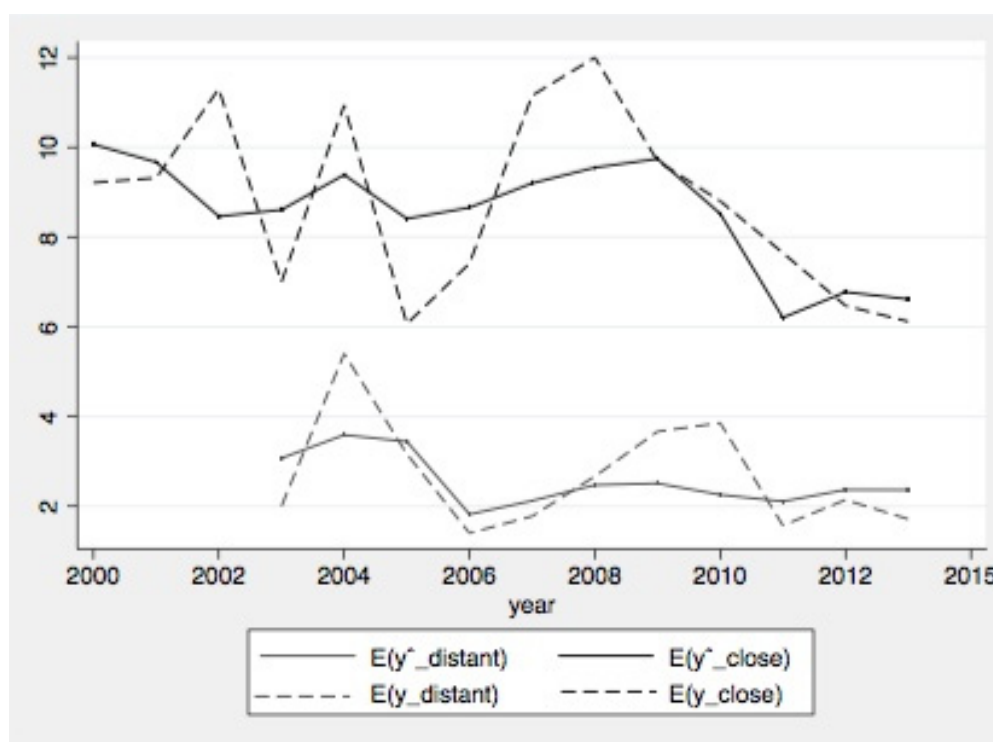
Source: Elaborated by the authors based on data from Fraz and Codato (2016) and Batista (2017).

³ Table A2 (Appendix) shows the model's results for the type of bills (PL, PLP, MPV, and PEC). In general, the effects present, in general, a similar direction as those found when bills are analyzed altogether. The ideological distance has a negative and statistically significant effect for PL and MPV. On the other hand, the change of minister has a negative and statistically significant effect on PL and PLP. In turn, the legislative experience has a positive and statistically significant effect on PL. There are fewer non-zero data per type of bill (only 47 for PLP and PEC, with 24 non-zero values), making it difficult to estimate effects consistently when considering the type of bills disaggregated.

There is empirical evidence of a gap in legislative production between ministries subject or not to the change of minister after 2004. Graph 3 also shows the average annual value of the number of bills and the expected number of bills for the group of ministries subject to high ideological distance, represented by the series in gray ' $E(y_distant)$ ' and ' $E(y_distant)$ ', respectively, and at a low ideological distance, represented by the series in black ' $E(y_close)$ ' and ' $E(y_close)$ ', respectively.

The averages were computed year by year for the group of ministries subject to the ideological distance above the third quartile of the variable (0.26) and for those below the third quartile, separately. As in Graph 2, the predicted number of bills was generated by the zero-inflated negative binomial model, which uses the first lag of budget and the lag in the number of DAS positions to control the possible endogeneity of variables.

GRAPH 3 AVERAGE NUMBER OF BILLS OBSERVED AND ESTIMATED, DEPENDING ON THE IDEOLOGICAL DISTANCE



Source: Elaborated by the authors based on data from Fraz and Codato (2016) and Batista (2017).

Unlike the change of ministers, it seems that greater ideological distance has always been associated with a ministry's lower legislative production. This reduction is more significant than that caused by other variables, a result observed by the marginal effects reported in Table 3 in all estimated models.

The results do not refute the two hypotheses, demonstrating the relevance of cabinet stability, the ideological cohesion between the ministers' parties and the president's party, and the control of the ministers' legislative experience. Theoretical expectations based on specialized literature were not empirically refuted for the recent Brazilian case. The negative effect of the change of ministers on the legislative production of ministries was empirically observed, strengthening the thesis of cabinet instability as an obstacle to policy design and formulation.

The development of new bills and policies takes time and requires some degree of predictability, which is hampered by the change of minister, generating a breakdown in decision-making routines, and interrupting the flow of information within and outside the ministry. Cabinet instability reduces the efficiency of policy formulation – in our study, policies that require passing a bill. However, the legislative experience of ministers and the ideological heterogeneity in the cabinet have a more significant impact on the ministries' legislative production.

The political capital of ministers who held elected positions, the connections, and the legislative expertise are individual elements that corroborate the expectation of a more productive ministry. Personal characteristics of ministers are also relevant for understanding the cabinet's performance and previous legislative experience is an important asset for greater efficiency in policy formulation. In the Brazilian coalitional presidentialism, with one of the highest party fragmentations in the world, the ideological preference of the parties chosen to integrate the government is a key element for its proper functioning.

The ideological distance between the ministers' and the president's parties is crucial to understanding the government's performance. The cost of ideologically heterogeneous coalition governments was quite evident in the results. Although cabinet instability is harmful, the ideological distance between the president's party and the ministers' parties represents an even greater obstacle and may severely threaten ministries' performance in Brazil.

5. FINAL CONSIDERATIONS

Ministries are important mechanisms in producing laws in the Brazilian federal government. This research contributed to the debate on the relationship between cabinet stability and the ministries' legislative production through a systematic empirical analysis of recent governments. Empirical tests produced two significant findings. The first confirmed the expectation of a negative effect arising from a change of minister on the ministry's legislative production, a variable mobilized as a parameter of ministerial performance. An advantage of the design adopted in this study is its ability to observe the same behavior (i.e., legislative production) for twenty years and across all ministries in Brazil. This guarantees a reasonable generalization of our findings to the Brazilian case, consolidating the perception of the importance of cabinet stability in public administration.

The second significant finding concerns the magnitude of the cabinet instability effect. When contrasted with the ideological distance between the president's party and the ministers' parties, change of ministers demonstrates less negative effects on the ministry's performance. The political appointments to positions in ministries made by allied parties that are programmatically and ideologically distant from the president represent a challenge to the ministries' legislative production.

The difficulty in managing a party coalition with low cohesion (Bertholini & Pereira, 2017) can negatively affect the ministry's legislative production.

The results point to interesting avenues for future research. As our study is characterized by finding a pattern of behavior among all Brazilian ministries for twenty years, qualitative case studies can be conducted based on our findings to refine the explanatory mechanisms connecting the change of ministers, legislative experience, and ideological distance to the ministries' legislative production.

The inference about bills' impact and magnitude is a component of this research agenda yet to be explored. Diversifying the observed variables is also a path that contributes to improving the understanding of the ministries' performance. Cabinet instability and the ideological heterogeneity within the Brazilian coalitional presidentialism significantly affect legislative production (focused on policy design and formulation) and policy implementation and evaluation.

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APPENDIX

TABLE A1 POISSON MODEL, IV POISSON MODEL, AND LINEAR MODEL BY THE ORDINARY LEAST SQUARES METHOD (OLS)

	Average Marginal Effects					
	Poisson		IV Poisson		OLS	
	A	B	C	D	E	F
Change of minister	-0.86 (0.35)**	-0.80 (0.31)***	-0.74 (0.25)**	-1.98 (0.93)**	-0.66 (0.29)**	-0.68 (0.25)**
Ideological distance	-3.90 (1.82)**	-3.80 (1.75)**	-3.22 (1.09)***	-3.18 (0.98)***	-2.29 (0.86)**	-2.01 (0.81)**
Legislative experience	1.31 (0.40)***	1.34 (0.38)***	1.27 (0.49)***	1.70 (0.48)***	1.04 (0.58)	1.02 (0.55)
Ministry budget	7.02 (6.72)	No	No	No	4.69 (5.05)	No
Public opinion	0.00 (0.08)	No	No	No	0.01 (0.07)	No
Legislative seats	0.01 (0.04)	No	No	No	0.00 (0.03)	No
Fixed effect control	Yes	Yes	Yes	Yes	Yes	Yes
Control DAS 1 to 6	Yes	Yes	Yes	Yes	Yes	Yes
Observations	347	352	275	248	347	352

Notes: The table presents the marginal effects of each variable and the respective robust standard error in brackets, calculated using the delta method. Columns A, B, and C show the effects of the Poisson model. Column D presents the effects of the IV Poisson model with instruments for change of ministers. Columns E and F show the effects of the linear model by OLS. In columns C and D, the bills distribution outliers (null values or more than 20 bills) were excluded from the estimation (approximately 10% of the lower tail and 10% of the upper tail).

** Statistically significant at the 5% significance level.

*** Statistically significant at the 1% significance level.

Source: Elaborated by the authors.

TABLE A2 **NEGATIVE BINOMIAL MODEL: DISAGGREGATED EFFECTS**

	Average Marginal Effect			
	PLP	PL	MPV	PEC
Change of minister	-0.16 (0.08)**	-0.74 (0.33)**	-0.02 (0.31)	0.01 (0.06)
Ideological distance	-0.11 (0.15)	-1.82 (0.82)**	-2.25 (0.72)***	-0.13 (0.15)
Legislative experience	0.01 (0.07)	0.92 (0.39)**	0.47 (0.35)	0.03 (0.05)
Fixed effect control	Yes	Yes	Yes	Yes
Control DAS 1 to 6	Yes	Yes	Yes	Yes
Observations	352	352	352	352

Notes: The table presents the marginal effects of each variable and respective robust standard error in brackets, calculated using the delta method.

** Statistically significant at the 5% significance level.

*** Statistically significant at the 1% significance level.

Source: Elaborated by the authors.