Intergovernmental transfers to the Brazilian unified health system and party alignment

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Abstract

Purpose – This study investigates the impact of political alignment on intergovernmental transfers to the Brazilian unified health system (SUS). The authors analyzed both automatic transfers based on pre-established rules and discretionary transfers, using two criteria of political alignment between mayors and the central government.

Design/methodology/approach – For the empirical analysis the authors used regression-discontinuity design (RDD) and the outcomes of close elections between 2001 and 2017.

Findings – The results indicate positive and statistically significant effects of party alignment on the two transfer categories, especially discretionary transfers, but also on transfers based on pre-established rules. The effect of direct party alignment, when mayors and the president are from the same party, is greater than that resulting from coalitions established in municipal and federal elections.

Research limitations/implications – The positive effect of party alignment was found both in discretionary transfers (those that do not have previously established rules) and some non-discretionary transfers (although they have previously defined regulations). A part of these regulations depends on production capacity and on taking part in programs promoted by the central government, which may produce entropy in the financing system, and a margin to benefit political allies. In the case of the SUS system, it is possible that this entropy is greater in the basic health care category than in the moderate and high complexity one, allowing a higher margin for discretion in transfers allocated to the former. Stricter rules associated to basic health care transfers would be desirable.

Practical implications – In Brazil, stricter rules and monitoring associated to basic healthcare intergovernmental transfers would be desirable.

Social implications – The results may inspire some improvement in the mechanisms that govern the distribution of resources to basic healthcare in Brazil, improving social welfare by improving social justice in the distribution of resources to basic healthcare.

Originality/value – The authors does not know any other study about the impact of party alignment on the distribution of intergovernmental transfers to the Brazilian unified health system.

Keywords Intergovernmental transfers, Health care, SUS, Political alignment

Paper type Research paper

1. Introduction

In order to reduce health inequality and to provide better health care for the population, many resources are annually invested in public health in Brazil through the unified health system (SUS). One of the various government mechanisms to guarantee the operation of SUS, and to provide a wide distribution of health services, is the transfer of resources from central government to local governments. The system is based on the idea that local governments are more able to identify specific needs and, therefore, SUS made the municipalities the main

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authorities responsible for their populations' health, guaranteeing the receipt of resources, transferred from funds specifically allocated to health.

The 1988 Federal Constitution established the bases of Brazilian federalism and since then the country has been widely using intergovernmental transfers to guarantee the adequate distribution of various public services. Brollo and Nannicini (2012) found evidence that, in municipal election years, municipalities with mayors who were not politically aligned with the president, received an average of 30% less transfers for infrastructure. The study reveals that the Brazilian municipalities' dependence in relation to resources passed on by the central government may result in an increase/reduction in the volume of transfers, due to political alignments between government hierarchies, operating as a mechanism of competition and bargaining, since it promotes political incentives and counter-incentives.

The aim of this study is to evaluate if this mechanism of competition and bargaining also takes place with public health resources in Brazil. Almost all transfers to public healthcare in Brazil are subject to stricter distribution rules when compared to those directed to infrastructure studied by Brollo and Nannicini (2012), and discretionary transfers in general, thus making the health sector an interesting case for analysis, since political favoritism would be at first more difficult in sectors that use pre-established rules. Therefore, the main question is if political favoritism related to intergovernmental transfers in Brazil prevails also in sectors with stricter distribution rules.

It is also worthy to emphasize that the health sector is one of the most complex sectors in society, recognizably being one of the most difficult to coordinate. The Brazilian state is responsible for the universal provision of health services as one of its obligations, making SUS management one of the greatest challenges of public administration in Brazil.

The political affiliation of the elected mayor in a municipality is inevitably related to its characteristics and its citizens who, in turn, determine a series of political decisions. This fact complicates the attribution of causality between the mayor's political affiliation and any municipal political decision, whatever the sector. With the aim of minimizing problems of endogeneity, the authors adopted the regression-discontinuity design (RDD) approach, using the results of municipal elections in which there was a marginal difference between the elected mayor and its best opponent.

The authors analyzed the period between 2001 and 2017, using data on federal resources allocated to the health sector, obtained through the Ministry of Health (DATASUS), and electoral data provided by the Superior Electoral Court (TSE). The research was organized into further six sections, in addition to this introduction. The second section gives a brief description of federalism in Brazil and the implications of this system for allocating public resources; and then it succinctly presents some studies on the relation between political alignment and the receipt of transfers. The third section describes the Brazilian electoral system, and the fourth, intergovernmental SUS transfers. In the fifth section, the authors presents data and the empirical strategy, followed by the analysis of the results in the sixth section and, finally, the conclusions. The results indicate positive and statistically significant effects of party alignment both on basic healthcare transfers, which are subject to pre-established distribution rules, and discretionary transfers.

2. Federalism, intergovernmental transfers and political alignment

Federalism was introduced in Brazil in 1879 and has been abolished more than once in the last 130 years. Therefore, it underwent an improvement process until it achieved its current status, which guarantees administrative and fiscal decentralization, and in which the public authorities are divided into the following entities: one central government, one federal district, 26 states and more than 5,570 municipalities. This political configuration also has the characteristic of coexistence between the executive and legislative powers at the three government levels (federal, state and municipal), and the judiciary at federal and state levels.

Political and fiscal decentralization is one of the conditions for the formation of federalism, since political and financial dependence prevents federative sub-units from exercising their autonomy and, therefore, mischaracterizes the entire system. The defense of decentralization assumes that local governments have a greater capacity to diagnose needs and, therefore, to allocate resources more efficiently. In addition, the idea is that the transfer of power to states and municipalities increases the responsibility of local governments regarding the use of public resources, enabling public policies that are more suitable for the people, with greater accountability and responsiveness.

However, relations between the central power and local governments may not be that simple and objective, since they involve different institutions at the same time. Leaders, political representatives, parties, decision-making bodies and society interact simultaneously through decisions, choices, mechanisms and strategies, each with different reasons and subterfuge, in order to achieve their own interests.

Therefore, the redistribution of resources may be guided by varying incentives, which may be more linked to political than economic interests. Intergovernmental transfers are transactions that result both from clearly established criteria and from negotiations between government hierarchies, reinforcing the hypothesis that politicians may use intergovernmental transfers as a way of achieving individual and/or party power through political alignment.

From the perspective of political interests, Duchateau and Aguirre (2010) highlight three possible incentives for budget allocation: electoral competition, ideological favoritism and party alignment; in other words, central-local relations are not always non-partisan. These determinants may produce an inefficient allocation of resources, since the result of ideological favoritism would be of more federal resources allocated to local governments with the same political dogma as the federal government representative. On a more superficial level, a parallel could be formed with the position (left or right) that the politician subscribes to; in other words, if the president is from the left, for example, more resources may be allocated to municipalities with left-wing mayors. A similar result would be found when party alignment exists; in other words, more resources may be allocated to municipalities with mayors from the same political party as the president, or the same coalition. Electoral competition would produce incentives for politicians to allocate more resources to municipalities that maximize their probability of winning.

Many empirical studies find evidence on political motivation in intergovernmental transfers. These studies refer to countries with different levels of development and political structure, and use different methodologies. Table 1 summarizes 10 of the main studies, highlighting the authors, the countries studied and the results. The majority identifies a positive effect of local government support to central government on locally received transfers, with the exception of Banful (2011), Gonschorek, Schulze, and Sjahrir (2018) and Kresh and Schneider (2020). Larcinese, Rizzo, and Testa (2006), Solé-Ollé and Sorrivas-Navarro (2008) and Brollo and Nannicini (2012) also found that party alliances, such as coalitions and party affiliation, for example, may favor the transfer of resources. Gonschorek *et al.* (2018), Brollo and Nannicini (2012), Bracco, Lockwood, Porcelli, and Redoano (2015) and Corvalan, Cox, and Osorio (2018) identified effects of the electoral cycle, with the goal of re-election. Kresh and Schneider (2020) identify negative significant effects of political alignment between mayors and governors of the same party on investments in the water and sanitation network, related to a mechanism of shared mandate provision of water and sanitation services.

Although the majority of studies deal with discretionary transfers, Banful (2011) highlights the use of pre-established formulas for the transfers that he had analyzed for Ghana, identifying political motivation as also influencing the transfer of these resources. This is a similarity with the study presented in this paper, since the biggest part of SUS transfers use pre-established formulas. Nevertheless, Banful (2011) estimates a fixed effects

Author (s)	Country	Results
Larcinese *et al.* (2006)	United States	States supporting the president in the last presidential elections are inclined to receive more resources than the others. The effect of party affiliation is also found, in which opponents receive less central government funds
Solé-Ollé and Sorrivas-Navarro (2008)	Spain	Party alignment has effects on resources transferred to municipalities, with greater effects when the governments (which donate and receive) are from the same party. Effects are also found when the ruling parties are part of the same coalition. An aligned municipality may receive up to 40% more than those which are not aligned
Arulampalam, Dasgupta, Dhillon, and Dutta (2009)	India	States that are aligned and, at the same time swing in state elections, receive transfers that are 16% higher than a state which is not aligned and is non-swing
Banful (2011)	Ghana	Finds evidence of higher transfers for locations with more undecided voters, despite the adoption of formulas; in other words, political representatives are seeking votes and party alignment does not have any effect
Brollo and Nannicini (2012)	Brazil	In municipal election years, the municipalities with mayors who are not politically aligned receive an average of 30% less in discretionary transfers for infrastructure
Jennes and Persyn (2015)	Belgium	The relation between ministerial representation and transfers may result from a mechanism in which the ministers respond to their electorate in the form of transfers and, in turn, are rewarded by the voters
Bracco *et al.*, 2015	Italy	Italian municipalities that are politically aligned with the central government receive higher transfers, and the probability of the aligned municipalities being re-elected increases by up to 30%
Corvalan *et al.* (2018)	Chile	Intergovernmental transfers increase in the year of municipal elections, and this increase is even higher when the political representatives are aligned, with the objective of re-electing the local political representative
Gonschorek *et al.* (2018)	Indonesia	Resources are not shared based on the population's needs, but on political need. Regions with little support for the central government receive more than those that give support during the president's first term. This is even clear in the year of central government elections. The authors argue that the president invested in the "districts" that opposed him in his first election, in order to win them over and be re-elected
Kresh and Schneider (2020)	Brazil	Municipalities with mayors who belong to the same party as the governor, and with self-run water and sanitation companies, had significantly lower investment in their water and sanitation network. The authors argue that the mechanism of shared mandate provision between municipal and state governments motivated state governments to try to expropriate local companies, exerting pressure on mayors who belonged to the same party to reduce water and sanitation services quality of self-run companies

Table 1.
Empirical studies on party alignment and transfers

Source(s): Prepared by the authors

model, while the empirical analysis presented in this paper for SUS transfers in Brazil uses the RDD identification strategy, which has been extensively used in the literature to deal with simultaneity bias problems.

3. The Brazilian electoral system

The hypothesis that party alignment influences intergovernmental SUS transfers requires an understanding of the multiple elements that govern both the Brazilian electoral system and the SUS financing system. Knowing the motivators, structural organizations, laws and regulations which support the systems enables an understanding of the driving forces of specific behaviors, strategies and instruments used to maximize the benefits of the varying agents who form both systems.

The Executive Power, the focus of this research, is formed by the president, governors and mayors, and elections take place every four years, in even-numbered years, and staggered, so that if municipal elections are held in year t, those for the president and governors take place in year $t + 2$. The elections are direct under the majority system, in which the winning candidate is the one who obtains the majority of the votes. This "majority" may be simple or absolute, depending on the size of the municipality, with a simple majority meaning that the candidate elected is the one who obtained more votes compared with his/her rivals. In the other majority system, the elections take place in two rounds and the candidate is elected only if, in the second round, more than half of the valid votes from the electoral district are cast on a single candidate; that is, in the second round the winner must obtain the absolute majority. Only municipalities with more than 200,000 voters adopt the absolute majority system. All the elected candidates must serve a four-year term and are eligible for re-election.

The Brazilian two round multi-party majority system makes the creation of party alliances favorable during electoral campaigns, also called coalitions. Griebler and Resende (2021) propose a model in which the leading parties compete for the support of the small parties offering transfers (e.g. government positions, support in other elections, prestige and power of being a part of the winning alliance). They sustain that two driving forces are behind the alliance decision-making process: mainly pragmatism, but also ideology. In this context, if the parties' objective is to win the election and/or achieve political representation, then coalitions will be used as a strategy to reduce the risk of losing the election and, therefore, of increasing the chances of gaining political representation. Pragmatism is the strongest driving force, but ideology is also taken into account.

Silva (2022) presents an empirical analysis of pre-election coalitions in executive elections. The authors provides evidence that the executive candidate may welcome coalition partners not only because of the votes that they can deliver, but also because of the campaign resources that they can bring to the coalition.

In Brazil, different party associations can be identified at varying federative levels; in other words, the composition of coalitions is different at federal, state and municipal levels. This phenomenon may take place because the party composition that maximizes the benefits for a specific election will be different, in accordance with the associated context and regional issues and, therefore, the results of party alignment need to be observed, from the perspective of coalitions established in federal and municipal elections.

4. Financing the unified health system (SUS)

In the search to equalize different regional needs and to guarantee the right and access to health to all citizens, the constitution in Brazil sets out that health-related actions must be decentralized and promotes an integrated action between the states. Constitutional Amendment 29 of 2000 determines that SUS must be financed through funds collected by the federal government, states, federal district and municipalities, and allows the transfer of resources between the federative units.

The states and municipalities finance SUS, in part, with a minimum of 12 and 15%, respectively, of the sum collected in taxes that are due to them, but the federal government is the main funder of public health in the country. The percentage financed by the federal

government was between 50 and 42% during the period between 2003 and 2017, but since 2016 the federal government started to contribute with increased percentages from its net current revenue and, since then, the total amount of these resources are budgeted in accordance with a pre-established amount adjusted for GDP growth. Although the federal government provides the majority of the resources, the municipalities are the main authorities responsible for allocating the resources originated both from intergovernmental transfers and their own tax revenue.

Every municipality is responsible for basic and preventive procedures, while other procedures (subject to economies of scale) are allocated to specific municipalities, with the aim of reaching the majority of a region's population. Cosio, Mendes, and Miranda (2008) divide intergovernmental transfers into two categories: fund-to-fund and agreements. Both are linked and should be spent and allocated according to a legal specification or contract. Agreements are negotiated between the constituent units and, therefore, are transfers that take place voluntarily, and may be conditional or not. Fund-to-fund transfers are mostly mandatory and automatic, and must be allocated for some specific purposes.

The Health Pact was introduced in 2006, and defined the federative units' responsibilities, clarifying the role of each one. This pact also established six groups of procedures to which the fund-to-fund transfers should be allocated, called financing blocks: (1) basic health care, (2) moderate and high complexity health care; (3) health surveillance, (4) pharmaceutical assistance, (5) SUS management and (6) investments (this block is not mandatory and depends on the presentation of a project).

The resources allocated to the basic health care block are mandatory and divided into fixed and variable basic healthcare levels (fixed and variable PAB). For the fixed component, the amount allocated to executing basic health care activities is calculated based on a per capita sum. Piola, Benevides and Vieira (2018) highlights that since 2011 this sum has been defined in accordance with the size of the municipality (divided into bands, as per number of inhabitants). Then the value for each group is adjusted by rates, based on the per capita gross domestic product (GDP) and other measures such as the percentage of the population in a situation of extreme poverty (population receiving *Bolsa Família*, a cash transfer program), the percentage of the population with private health insurance and the municipality's demographic density.

The variable PAB is the most representative component of the basic health care block and an average of more than 65% of the resources of this block are allocated to this component. As a strategy to encourage programs that promote basic health care, the value of this component is linked to participation in incorporated programs; in other words, they are parameterized in accordance with the municipality's production capacity. The family health, community health agent and oral health programs are the most significant.

The moderate and high complexity health care (MAC) block is allocated to more sophisticated procedures and actions and is divided into two components: the strategic actions and compensation fund (Faec) and the moderate and high complexity outpatients and hospital financial limit (LFMAC). Not all the municipalities are eligible for the receipt of these resources and the parameters that define the sums that must be transferred are based on production, coverage and the provision of services, in addition to a fixed per capita amount.

The four remaining financing blocks receive less than 20% of the annual resources destined to fund-to-fund transfers. The smallest is the investment block, which was created in 2009, is not mandatory and is conditional on the presentation of a project. The Ministry of Health must approve it following the presentation of a proposal that the Bipartite Interagency Commission had previously evaluated. In other words, this block leaves room for negotiations between the institutions involved. But once the project is approved, the resources are automatically transferred from fund to fund.

According to Piola *et al.* (2018), the health surveillance block is linked to actions to promote health and surveillance, prevention and the control of diseases and risk factors, also guaranteeing the execution of sanitary surveillance actions, and the qualification of laboratory analyses on the topic. The pharmaceutical assistance block is allocated to financing both essential and non-essential medication, as well as long-term actions, such as prevention, diagnosis, treatment and the control of diseases. Finally, the SUS management block is allocated toward guaranteeing efficient administration, with regulation, control, evaluation, auditing and monitoring actions, as well as assistance in implementing and qualifying services and actions.

With respect to voluntary transfers, those are made up of agreements and resource transfer contracts, originating from government projects and defined from agreements, adjustments or other similar instruments, which the competent authorities approve. Cosio *et al.* (2008) reinforce the need for intergovernmental transfers being independent of political factors; in other words, the determination of values, metrics and guidelines for division and frequency should take place through clear, transparent and objective criteria. These authors classify the voluntary transfers and the investment block as having little independence, considering that they result from negotiations.

When seeking to understand the complex transfer system that finances SUS services, the question that remains is: can the criteria for the division of SUS transfers, at least considering fund-to-fund transfers, really be considered clear, transparent and objective?

The criteria for division were constructed and defined by four main regulations: Law No. 8.080/1990, Law No. 8.142/1990, Constitutional Amendment No. 29/2000 and Act No. 141/2012. The first law aimed to reduce the level of discretion in intergovernmental SUS transfers, establishing seven criteria that should be combined for the division of resources, with 50% taking place automatically, and the remaining 50% following the technical analysis of programs and projects. However, the methodology to establish the criteria was not defined and three months later the Law No. 8.142/1990 was approved, defining the principle that 100% of the transfers were regular and automatic, as well as establishing that while the methodologies were not defined, the population criteria should be used for their division. Despite this, only the fixed PAB use the per capita criterion, and the other components use criteria other than those established by law. Act No. 141/2012 added criteria for division and determined that the Tripartite Interagency Commission is responsible for proposing the methodology to establish the criteria and submitting the proposal for National Health Council approval. However, the methodology has not yet been approved neither implemented.

This entire process of successive and frustrated attempts to determine objective criteria for the division of resources highlights the difficulties involved in negotiating this type of distribution, and suggests that, despite all the initiatives to avoid discretion, subjectivity and a certain amount of discretion still remain in this area.

The adoption of formulas with established parameters is an instrument that governments use to reduce the political role in the allocation of resources, but Banful (2011) finds evidence that this mechanism does not eliminate political steering in transfers carried out in Ghana to the District Assemblies Common Fund, which is calculated based on formulas. He finds evidence that the formulas are manipulated for electoral objectives.

With the exception of the Fixed Basic Health Care Limit (fixed PAB), determined by a set rule that depends on the size of the population and other economic and demographic indicators, it appears that loopholes can be found that allow a certain level of flexibility in the decision to transfer health resources. Even though the biggest part of these transfers (the main fund-to-fund transfers) is mandatory and considered automatic, its distribution is based on local production and this is difficult to define and measure. Although the criteria for the division of costs are defined, these rules do not seem to be clear enough to completely prevent divisions that are correlated with party alignment.

5. Data and empirical strategy

5.1 Data

The data analyzed includes the period between 2001 and 2017 for the 5,570 municipalities spread throughout all the Brazilian states. The data sources were: (1) data made available by the Ministry of Health (DATASUS) on resources allocated to the health sector, (2) electoral data obtained from the Superior Electoral Court (TSE), with information on elections that took place between 1998 and 2016; (3) data from the Brazilian Institute of Geography and Statistics (IBGE) on the municipalities' general characteristics, (4) Institute of Applied Economic Research (IPEA) data on the municipalities' economic characteristics and, lastly, (5) data obtained from the Federal Court of Auditors (TCU), with information collected from the municipalities.

In Brazil, political positions are occupied by the elected candidate for four years and, following this period, new elections are held. Municipal elections are interspersed with federal and state elections. Therefore, the electoral data for this research includes five federal and state elections (1998, 2002, 2006, 2010 and 2014) and five municipal elections (2000, 2004, 2008, 2012 and 2016). Although the mayors are elected every four years, party alignment between the central and municipal governments may change every two years.

Two different party alignment concepts were defined, called A and B, respectively: (A) if the mayor and the president in office in certain year are from the same party, and (B) if the party of the mayor in office is part of the coalition with the president in office. Table 2 presents the percentage of municipalities with party alignment during the period between 2001 and 2017:

An expressive decrease in the number of mayors aligned with the president can be observed in 2003, when there is a change in power in the federal sphere. Nevertheless, since the following municipal election, in 2004, the authors observes a growth in party alignment that is upheld over the years. In addition, Table 2 suggests that party alignment B is more expressive, and changed significantly following the 2010 presidential elections, despite the workers' party (PT) remaining in the presidency.

This study is concentrated on municipalities that had closely-fought elections; in other words, in which the elected candidate had a relatively small margin of victory, compared with its best opponent. Table 3 demonstrates that the number of municipalities with closely-fought elections, divided into bands of difference up to 1, 5 and 10% points, is similar over time.

In addition to the electoral data, the National Health Fund gross transfer values allocated to the municipalities during the period between 2001 and 2017 were obtained from the Ministry of Health. The fund-to-fund transfers were separated in the six categories existing until 2017: basic healthcare, moderate and high complexity, health surveillance,

Table 2.
Municipalities with party alignment (in percent)

Year of reference	Year of municipal election	President's party	Party alignment A	Party alignment B
2001/2002	2000	PSDB	17.8	56.2
2003/2004	2000	PT	3.5	8.0
2005/2006	2004	PT	7.4	15.0
2007/2008	2004	PT	7.4	7.6
2009/2010	2008	PT	10.2	11.9
2011/2012	2008	PT	10.2	53.6
2013/2014	2012	PT	11.6	52.6
2015/2016	2012	PT	11.6	60.0
2017	2016	PMDB	18.9	57.9

Source(s): Prepared by the authors with TSE data

pharmaceutical assistance, SUS management and investment (not compulsory). In addition to the fund-to-fund transfers, agreements and transfer contracts were included in the analysis. Although the values increase over time, the authors did not observe any significant changes in the relative levels allocated to each category.

The level of discretionary transfers, called agreements, changed its threshold in 2003. In 2000, it represented 16.1% and, in 2017, it represented just 8.06%. In Table 4, the creation of the "investment" category in 2009 can be identified, as well as the abolition of the "non-regulated" category in 2011. Transfers allocated to moderate and high complexity procedures and services lead the volume, followed by basic health care transfers. If added together, the two categories represent an average of 83% of the total transferred, and the category that receives the lowest volume is that allocated to SUS management funding.

The majority of the transfers are dependent on demographic and socio-economic issues and the supply capacity installed in the municipalities, in addition to production criteria, as described in the previous section. When we observe the regional per capita transfer, the authors identified different levels for each region, highlighting the north region, which receives less transfers per inhabitant, although it has a child mortality rate higher than that of the center-west. This data can be observed in Table 5.

Year of municipal election	Difference of up to 1% point	Difference of up to 5% points	Difference of up to 10% points
2000	4.88	23.27	43.24
2004	5.28	26.32	48.82
2008	5.59	26.15	47.02
2012	5.38	26.66	49.04
2016	4.70	23.34	42.42

Source(s): Prepared by the authors with TSE data

Table 3. Municipalities with closely-fought elections (in percent of the total)

Year	Basic health care	Health surv	Pharm. assist	MAC	SUS mgt	Investment	Non-regulated	Agreement	Total
2001	32.73	1.73	1.17	48.28	0.00	0.00	0.00	16.10	100.00
2002	27.55	3.66	1.00	53.36	0.09	0.00	0.00	14.34	100.00
2003	29.11	3.71	0.88	49.26	0.13	0.00	0.00	16.91	100.00
2004	30.78	4.39	0.86	54.32	0.17	0.00	0.00	9.48	100.00
2005	29.71	4.08	0.77	54.07	0.13	0.00	0.01	11.22	100.00
2006	32.45	4.63	0.90	51.52	0.32	0.00	0.11	10.07	100.00
2007	30.99	3.85	1.88	51.32	0.17	0.00	0.12	11.66	100.00
2008	29.16	3.19	2.13	56.10	0.19	0.00	0.15	9.08	100.00
2009	31.32	3.38	2.18	55.02	0.19	0.00	0.19	7.71	100.00
2010	30.54	3.48	2.22	56.31	0.15	0.13	0.20	6.98	100.00
2011	30.31	3.24	2.22	54.87	0.34	0.81	0.18	8.03	100.00
2012	29.98	3.42	2.61	56.01	0.32	1.43	0.01	6.22	100.00
2013	32.26	3.34	2.08	51.69	0.20	2.21	0.00	8.23	100.00
2014	29.57	3.85	2.05	51.44	0.23	3.31	0.00	9.55	100.00
2015	28.40	2.98	1.74	51.84	0.13	4.33	0.00	10.58	100.00
2016	29.76	2.81	1.70	53.56	0.08	4.08	0.00	8.01	100.00
2017	30.80	3.82	1.84	50.74	0.06	4.29	0.00	8.45	100.00

Source(s): Prepared by the authors with MS data

Table 4. Municipal SUS transfers by category (in percent)

5.2 Empirical identification strategy

The aim of this research is to evaluate the impact of party alignment on intergovernmental transfers, from the federal to the municipal sphere, allocated to the unified health system in Brazil. The use of methodologies such as ordinary least squares (OLS) may generate biased results due to endogeneity problems. In order to minimize those problems, that result from factors that simultaneously determine the mayor's party and municipal health policy decisions, the authors used the RDD method. This method selects the municipalities in which the elected candidate had a small margin of victory, in comparison with its best opponent. The hypothesis behind this is that if the election of a candidate was closely-fought, the probability of his victory and of his/her best opponent would be the same; in other words, closely-fought elections are decided by random factors.

As explained in the third section, municipal elections have a well-established criterion to define the winning candidate, which is the one who obtained the majority of votes (simple or absolute majority). This characteristic favors the use of RDD, since its application requires an eligibility criterion for comparison between the treatment and control groups.

Only mixed observations were used; that is, only the municipalities in which the opposition candidates had different party alignments (sometimes this may not occur in the case of type B alignment). The politically aligned candidates' percentage of votes was defined as $V_{Ait,}$ and V_{Nit} is the non-aligned candidates' percentage of votes, where i represent the municipality and t represents the year of observation, between 2001 and 2017. The margin of victory is given by the advantage or disadvantage that the aligned candidates obtained in relation to their opponents. For this, the authors defined the margin of victory as m_{it}, using the following equation:

$$m_{it} = V_{Ait} - V_{Nit} \tag{1}$$

If $m_{it} > 0$, then the candidate from that municipality is elected with party alignment, while his/her opponent is not aligned. Municipalities that are in this situation form our treatment group. If $m_{it} < 0$, then the elected candidate is not aligned with central government and his/her opposition is, and this group is defined as the control group.

Imbens and Lemieux (2008) argue that when applying RDD, it is possible to identify the average causal effect of the treatment, due to the discontinuity of conditional expectation for the result, given the treatment variable. This effect may be obtained through the following expression:

$$\tau_{RDD} \equiv E\left[Y_{it}(1) - Y_{it}(0) \mid m_{it} = 0\right] = \lim_{m_{it} \downarrow 0} Y_{it} - \lim_{m_{it} \uparrow 0} Y_{it}$$

Where Y_{it} is the dependent variable that, in this study, corresponds to the volume of per capita transfers that the municipality received, for the treatment and control groups. To explore the discontinuity created from the treatment and control groups, the authors conditions to a margin of victory that tends to be 0. Thus, the treatment effect is estimated based on the following equation:

Region	Inhabitants	Transfers	Per capita transfers
Center-west	6.3	7.8	24.0
Northeast	27.4	30.6	21.6
North	8.4	7.1	16.2
Southeast	44.5	40.1	17.4
South	13.3	14.4	20.9

Source(s): Prepared by the authors with MS data

Table 5. Transfers by Brazilian region (in percent)

$$Y_{it} = \beta_0 + \beta_1 Al_{it} + X_{it} + f(m_{it}) + \varepsilon_{it}$$

Where Y is defined as the dependent variable, that is, per capita intergovernmental transfers allocated to SUS received by municipality i in t; X is a vector of control variables; Al_{it} is the party alignment dummy (which varies in accordance with the alignment definition and is equal to 1 for the treatment group, and equal to 0 for the control group). Lastly, the function $f(m_{it})$ is a polynomial calculated on the margin of victory, m_{it}. Party alignment may be changed every two years, but the difference in votes (in absolute terms) between the main municipal election candidates of year t is the same until $t + 4$. However, it should be highlighted that as m_{it} depends on alignment, its value can be changed in the last two years of the mayor's term and, therefore, the municipalities may become part of the control or treatment group every two years.

Two methods are disseminated for the use of RDD: sharp regression discontinuity design (SRDD) and fuzzy regression discontinuity design. The authors has used the SRDD method, since it is indicated for deterministic variable analysis, as is the case of municipal elections, which, by law, take place in the same years for every municipality, with only one winner, who obtains the majority of votes. The narrow margin of victory that determines the interval around the cut-off point (bandwidth) was calculated based on the algorithm [1] proposed by Calonico, Cattaneo, and Titiunik (2014), and the cut-off point was established at 0. In order to calculate $f(m_{it})$, the Kernel triangular method [2] was used, and the results were analyzed at levels of significance of between 1, 5 and 10%.

There is a high heterogeneity in municipality size and, therefore, the transfer values, which were measured in thousands of Reais, were converted into per capita values, as already mentioned, deflated by the 2017 National Consumer Price Index and finally transformed into a logarithm, with the aim of reducing outlying effects. Municipalities with only one candidate, or that held supplementary elections, were excluded from the analysis.

6. Results

The results of the effects of party alignment on intergovernmental SUS transfers were estimated for the total amount of SUS transfers, the total amount of fund-to-fund SUS transfers and for the three main investment blocks (basic health care, moderate and high complexity health care and agreements), considering the two previously defined political alignment concepts. In principle, RDD models guarantee the internal validity of the results; in other words, they estimate the effect of the treatment variable on the outcome variables for the observations that are close to the cut-off point, which, in the case of this study, correspond to municipalities where elections were won by a close margin of victory. Thus, it cannot be stated conclusively that the results would be valid for all municipalities. This is a limitation of the RDD models, adopted to permit the attribution of causality to treatment, even if only internally. Therefore, testing the internal validity of the results is of the utmost importance.

Table A1, in Appendix, compares the means of seven variables between municipalities that had closely-fought elections (10 p.p. bandwidth) and the others. It can be seen that for five of the seven variables, including extreme poverty and infant mortality rates, the percentage difference of the means between the two groups is smaller than 2.5%. However, municipalities with closely-fought elections have clearly a higher coverage of healthcare insurance (coverage more than 20% higher) and a much higher population density. Thus, the results of this study may not be valid for all Brazilian municipalities, specially the small ones with low population density [3].

6.1 Internal validity and robustness of the model

The authors conducted two internal validity tests with the aim of verifying if the treatment and control groups (around the cut-off point) were statistically similar. The first test

conducted is a density test, which was initially created by Mccrary (2008) and presented by other authors at a later date. The authors used the method proposed by Cattaneo, Jansson, and Ma (2018) [4], in which the null hypothesis is that there is discontinuity in the running variable density function around the cut-off point. The test was conducted for both types of political alignment analyzed, with a bandwidth of 10% points. The *p*-value presented in Figure 1 graphs demonstrates the continuity of the density function for each alignment type.

The authors also tested if the political alignment in the sample of municipalities with closely-fought elections has a correlation with their other characteristics, which may indirectly generate biased results; in other words, the authors tested the covariate balance. The strategy adopted was of reproducing the RDD (without control variables) using the municipalities' characteristics as dependent variables and verifying discontinuity around the cut-off point. The variables tested were: the per capita GDP logarithm and per capita GDP squared logarithm, population logarithm, population squared logarithm, total per capita unconditional transfers logarithm (transfers not destined to a specific sector, called the FMP), infant mortality rate, population density, health insurance per capita and extreme poverty rate.

As already explained in Section 4, not all municipalities are eligible for the receipt of MAC transfers, that is, the group of municipalities that can receive MAC transfers is not equal to totality, and for that reason the authors has also tested the covariate balance around the cut-off point using the subsample of municipalities eligible for receiving these resources. A similar strategy was adopted for discretionary transfers, since not all municipalities negotiated these transfers in the studied period and the ones that tend to sign agreements may have unbalanced characteristics around the cut-off point. In this case the authors tested the covariate balance using the subsample of municipalities that received discretionary transfers at least in one of the years of the studied period. The results are described in Table 6.

For alignment B, the majority of municipalities' characteristics appear to be balanced around the cut-off point $m = 0$, except for *extreme poverty*. However, *population size* and *FPM resources* appear to be unbalanced in the case of municipalities eligible for MAC transfers and *population density* appear unbalanced for municipalities that received discretionary transfers in at least one year. For alignment A, the variables that seem not to be balanced vary according to the sample, and this includes the coverage of health insurance for the complete sample and for the sample of municipalities that received discretionary transfers. Given these results, all the characteristics that presented signs of being unbalanced were included as control variables in the RDD regressions, and the population size was included as a control variable in all regressions, even if the balance tests indicated good balance.

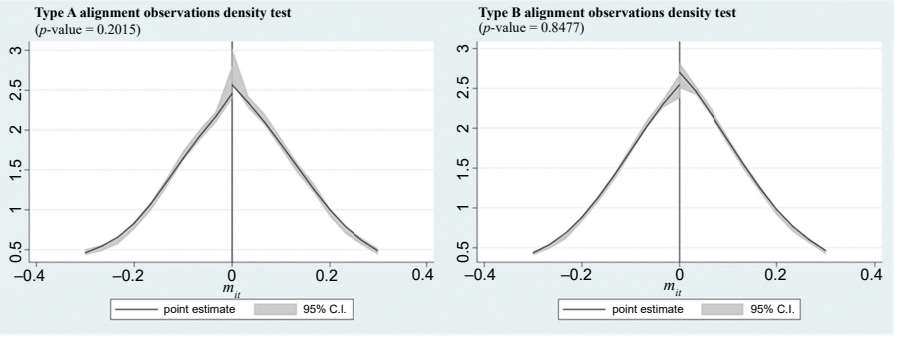

Figure 1.
Margin of victory density tests

Source(s): Prepared by the authors with study data

Table 6.
Model's internal validity results

Dependent variable	General mean	Initial no of observ align. A	Initial no of observ align. B	Municipalities with transfer to SUS (total) Alignment A		Alignment B		Municipalities with transfer to MAC Alignment A		Alignment B		Municipalities with discretionary transfers Alignment A		Alignment B	
				Band-with	Coefficient	Band-width	Coefficient	Band-with	Coefficient	Band-width	Coefficient	Band-with	Coefficient	Band-with	Coefficient
GDP per capita log	9.46397	17,014	33,596	0.117	0.01256 (0.0325)	0.121	−0.00329 (0.02279)	0.120	0.01544 (0.04616)	0.100	−0.03244 (0.03385)	0.130	−0.07788 (0.04784)	0.128	−0.0113 (0.03596)
GDP per capita squared log	18.9279	17,014	33,596	0.117	0.02512 (0.06499)	0.121	−0.00657 (0.04558)	0.120	0.03087 (0.09232)	0.100	−0.06487 (0.0677)	0.130	−0.15575 (0.09569)	0.128	−0.0226 (0.07193)
Population log	9.437362	18,970	36,374	0.113	−0.10019** (0.05075)	0.141	−0.02274 (0.03181)	0.165	−0.12393* (0.06722)	0.124	−0.094* (0.05223)	0.123	−0.10764 (0.0834)	0.131	−0.01226 (0.05866)
Population squared log	18.87472	18,970	36,374	0.113	−0.20038** (0.10149)	0.141	−0.04548 (0.06361)	0.165	−0.24785* (0.13443)	0.124	−0.18801* (0.10445)	0.123	−0.21529 (0.1668)	0.131	−0.02452 (0.11732)
FPM resource log	15.93995	18,970	36,374	0.115	−0.05273*** (0.02798)	0.167	−0.00747 (0.01684)	0.179	−0.04396 (0.0354)	0.130	−0.06478** (0.02781)	0.118	−0.05896 (0.05181)	0.130	70.6e-05 (0.03646)
Infant mortality	15.99629	18,961	36,342	0.128	−0.54362 (0.59074)	0.143	0.07875 (0.39913)	0.150	0.29236 (0.65888)	0.210	0.60997 (0.40282)	0.150	−0.43987 (0.79231)	0.152	0.01664 (0.57452)
Population density	110.6791	18,987	36,397	0.097	39.739 (−26.856)	0.093	12.102 (18.427)	0.102	107.26** (53.383)	0.119	46.835 (30.618)	0.106	121.18** (−61.073)	0.124	75.28** (37.053)
Health insurance per capita	0.0688704	18,970	36,374	0.140	−0.00898** (0.00462)	0.109	−0.00379 (0.00348)	0.102	−0.01359 (0.0087)	0.117	−0.00851 (0.0052)	0.135	−0.01493* (0.00828)	0.200	−0.00209 (0.00453)
Extreme poverty	0.2853021	18,987	36,130	0.142	0.0484*** (0.01792)	0.105	0.04666 (0.01478)***	0.128	0.0164 (0.02651)	0.089	0.04136* (0.02297)	0.143	0.06614** (0.02873)	0.166	0.04881** (0.02)

Note(s): (1) Standard errors are in parenthesis; (2) Levels of significance: $*p < 0.10$; $**p < 0.05$; $***p < 0.01$. The sample size is obtained automatically by the optimal bandwidth selection method, using the mean squared error of the RDD estimators; (3) Data sources were IBGE (for GDP, population size and population density), DATASUS (for infant mortality, rate of extreme poverty and health insurance per capita) and FINBRA (Public Finances Data from the National Treasury Secretariat, for FPM resources). GDP is measured in thousands of *Reais* per capita (both in logarithm), infant mortality corresponds to the number of stillbirths per thousand live births, and population density corresponds to the number of inhabitants per square kilometer
Source(s): Prepared by the authors with study data

6.2 Results

Table 7 presents the regression results for the first party alignment concept adopted in this study, in which the mayor and president in office are from the same party in the year of reference (alignment A), and Table 8 presents the results for the party alignment concept in which the party of the mayor in office is part of the president's coalition (alignment B). It is important to notice that in both cases the regressions were estimated with and without control variables. The population size, and all the variables that presented any signal to be unbalanced around the cutoff point, were included as control variables.

The estimated coefficients for basic health care transfers and discretionary transfers were positive and statistically significant for alignments A and B, both in the regression with control variables and the regression without them. Therefore, the results in Tables 7 and 8 suggest that municipalities with mayors politically aligned with the president's party received a higher percentage of basic healthcare transfers and discretionary transfers, when compared with municipalities with mayors not aligned, and the effect of direct party alignment (alignment A) is stronger than that resulting from coalitions established in municipal and federal elections (alignment B). The coefficients were also positive and statistically significant for the total SUS transfers and total fund-to-fund SUS transfers, but not for the moderate and high complexity transfer category. This block presented a negative and significant coefficient for the regressions related to alignment A, but the coefficient is not statistically significant for the regressions related to alignment B.

The significant and positive effect of alignment with the president's party on transfers are in line with the initial hypothesis put forward in this study, that political alignments with the central power may increase transfers of resources between the federal and state governments and the municipalities. The result, in the case of discretionary transfers, is more commonly found in literature but, in this study, the authors also suggests the possibility of effects of party alignment in the case of transfers carried out based on pre-established production regulations, and the results found support this idea. These results are in line with those of Banful (2011) for Ghana, who identifies political motivations as also influencing transfers calculated from pre-established formulas.

Nevertheless, the results related to the moderate and high complexity transfer category (MAC transfers) were not expected. A possible explanation to the non-significance of MAC transfers' coefficients (Table 8) may be that the rules and procedures that determine this type of transfer tend to be more objective and easier to check when compared to the rules and procedures that determine the other SUS fund-to-fund transfers. Although the values of MAC transfers and Variable PAB transfers are both based on production, Variable PAB transfers are largely determined by the participation of municipalities in some basic health care programs that are not so easy to monitor and account, while MAC transfers are determined by the supply of some complex health services (like hemodialysis), whose monitoring and accounting tend to be easier. It is also important to notice that not all municipalities are eligible for MAC transfers, while all of them are eligible for PAB transfers, therefore MAC transfers may be easier to monitor because they involve a smaller number of municipalities.

It is surely more difficult to explain the negative significant coefficients of MAC transfers' observed for alignment A (Table 7). Those are really unexpected. One possible explanation may be that better basic healthcare can reduce the necessity of moderate and high complexity health services, in such a way that municipalities that receive relatively more support to basic healthcare can start to demand less MAC transfers, but this explanation certainly needs more investigation.

To summarize, the empirical results indicate a positive effect of party alignment both in discretionary transfers (those that do not have previously established rules) and some non-discretionary transfers (although they have previously defined regulations). As argued above and in the previous sections, a part of these regulations depends on production capacity and

Table 7.
Results for mayors from the same party as the president (alignment A)

				No controls					With controls			
				Calculated bandwidth		Bandwidth = 10%			Calculated bandwidth		Bandwidth = 10%	
Dependent variable	General mean	Initial no of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ
Total SUS fund-to-fund transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.144676	18,970	0.121	0.02183* (0.01151)	9,994	0.02227* (0.0126)	8,037	0.105	0.02228** (0.01055)	8,733	0.02277** (0.01087)	8,037
Total SUS transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.186086	18,966	0.124	0.03415*** (0.01112)	9,990	0.03539*** (0.01236)	8,033	0.108	0.03428*** (0.01066)	8,729	0.03484*** (0.0111)	8,033
Basic health care transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	1.988193	18,962	0.136	0.04615*** (0.00987)	10,529	0.04528*** (0.01139)	8,036	0.098	0.03235*** (0.00889)	8,036	0.0325*** (0.00885)	8,036
MAC transfers *(controls: Population log, FPM resources log and Population density)*	1.289465	9,536	0.116	−0.16471*** (0.0634)	4,662	−0.15882** (0.06892)	3,953	0.123	−0.11507** (0.05609)	4,957	−0.10659* (0.06235)	3,953
Discretionary transfers (agreements) *(controls: Population log, Population density, Health insurance per capita and Extreme poverty)*	1.299761	7,855	0.113	0.12012*** (0.03979)	3,810	0.1194*** (0.04241)	3,267	0.126	0.0846*** (0.03137)	4,059	0.0870** (0.03509)	3,267

Note(s): (1) Levels of significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; (2) The sample size is obtained automatically by the optimal bandwidth selection method and also manually defined at 10% points bandwidth; (3) The set of control variables includes the logarithm of the population size for all the dependent variables, and then, for each dependent variable, it includes also the variables for which the balance tests suggested unbalance; (4) All the dependent variables correspond to the logarithm of the total value received, measured in thousands of Reais per capita
Source(s): Prepared by the authors with study data

Table 8.
Results for when the mayor's party was part of the president's coalition (Alignment B)

				No controls					With controls			
				Calculated bandwidth		Bandwidth = 10%			Calculated bandwidth		Bandwidth = 10%	
Dependent variable	General mean	Initial no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ
Total SUS fund-to-fund transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.144676	36,374	0.135	0.01424* (0.00837)	20,902	0.01694* (0.00981)	16,032	0.131	0.01232* (0.00727)	20,902	0.01369 (0.0084)	16,032
Total SUS transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.186086	36,370	0.126	0.0213*** (0.0081)	19,857	0.02421*** (0.00909)	16,029	0.123	0.01892*** (0.00718)	19,857	0.02067*** (0.00796)	16,029
Basic health care transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	1.988193	36,356	0.130	0.02076*** (0.00731)	19,849	0.02246*** (0.00829)	16,024	0.124	0.01482** (0.00596)	19,849	0.01437** (0.00663)	16,024
MAC transfers *(controls: Population log, FPM resources log and Population density)*	1.289465	18,647	0.131	−0.06499 (0.04116)	10,656	−0.07097 (0.04694)	8,170	0.139	−0.03769 (0.03678)	10,656	−0.03783 (0.0432)	8,170
Discretionary transfers (agreements) *(controls: Population log, Population density, Health insurance per capita and Extreme poverty)*	1.299761	13,540	0.161	0.04521* (0.02496)	8,748	0.06708** (0.03126)	5,883	0.146	0.03883* (0.02185)	8,075	0.05193** (0.02623)	5,883

Note(s): (1) Levels of significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; (2) The sample size is obtained automatically by the optimal bandwidth selection method and also manually defined at 10 percentage points bandwidth; (3) The set of control variables includes the logarithm of the population size for all the dependent variables, and then, for each dependent variable, it includes also the variables for which the balance tests suggested unbalance; (4) All the dependent variables correspond to the logarithm of the total value received, measured in thousands of Reais per capita
Source(s): Prepared by the authors with study data

on taking part in programs promoted by the central government, which may produce entropy in the financing system, and a margin to benefit political allies. In the case of the SUS system, it is possible that this entropy is greater in the basic health care category than in the moderate and high complexity one, allowing a higher margin for discretion in transfers allocated to the former.

The graphical analyses of the discontinuity of transfers around the cut-off point are in Appendix. The graphics enable a visualization of this discontinuity for discretionary transfers and those allocated to basic health care, for both alignments.

The authors also ran again the regressions dropping the municipalities that can potentially go to the second round. These results were included in Appendix, in Tables A2 and A3, and they were very similar to the results presented in Tables 7 and 8, obtained in the regressions including municipalities that can go to the second round (same coefficients' signals and significance levels and similar coefficients' magnitudes).

7. Conclusions

Public health in Brazil is a duty of the state, irrespective of the federative unit and, therefore, the efficient allocation of resources destined to this purpose is also its duty. The health system used in Brazil, SUS, has limited financial resources, which should be allocated based on objective criteria that aim to maximize the well-being of society and, therefore, should be impartial to political interests. In this study the authors observed, through an analysis of laws and standards on this subject, that there were frustrated attempts to create these objective criteria and metrics. The current criteria for the division of resources are partially based on the population size, but also on the municipality or state's productive capacity, and on taking part in programs and campaigns promoted by central government, as well as the possibility of direct negotiation between the entities in some categories.

Decentralization is one of the main characteristics of SUS, with the aim of reducing inequality. While this aspect promotes local autonomy, it also encourages interdependence and relations between the central power and local governments. The organization of the electoral system, associated to the interdependence of governments, may produce an allocation of resources based on political interests, which aim to gain/maintain power, and on ideological tendencies. Of the four main criteria for the division of SUS resources, highlighted in the previous paragraph, the last three ones open the way for leaders to use the resources with a political bias, in terms of patronage.

The aim of this research was to identify political bias in SUS transfers, using direct party alignment with the president as a metric, and also the alignment produced by coalitions established in federal elections. The authors analyzed the total amount of SUS transfers and fund-to-fund transfers (with distribution based on production and participation criteria), the two main categories of fund-to-fund transfers and discretionary transfers (established mainly through agreements). In order to estimate the causal effect of party alignment on these transfers, the RDD methodology was adopted for the municipalities that held elections with close margins of victory between 2001 and 2017.

The study found robust empirical evidence that party alignment has an effect on transfers allocated to municipalities through SUS, particularly for basic health care (variable PAB fund-to-fund transfers) and discretionary transfers. The effect of direct party alignment, when mayors and the president are from the same party, is greater than that resulting from coalitions established in municipal and federal elections. Only for the moderate and high complexity fund-to-fund transfer category (MAC transfers) the authors did not found a significant positive effect. In our analysis the authors conjectures that this happens because the rules that determine the value of MAC transfers are easier to monitor and account than the rules that determine Variable PAB transfers.

Political motivation in the distribution of resources, in the case of discretionary transfers, is commonly found in literature but, in this study, the authors also put forward the possibility of the effects of party alignment for transfers carried out based on pre-established production regulations, as is the case of SUS fund-to-fund transfers. The results found support this idea and are in line with those of Banful (2011) for Ghana, who identifies political motivations as also influencing transfers calculated from pre-established formulas.

This result is worthy of attention by public health managers in Brazil, since if municipalities with party alignment are favored, then resources are not necessarily being distributed to the municipalities that are more in need, and equity is known as one of the most important principles that govern SUS.

The identification of the exact mechanisms behind the effects demonstrated is still an open question. Although the literature generally emphasizes the rewards given to allies for support in the previous election, or support given to allies to help them to be re-elected, it can also be the case that allies just have more opportunities to communicate with police makers at the federal level, maybe receiving more advice about how to take part in programs promoted by central government. Nevertheless, the available data does not allow this kind of test.

Notes

1. Stata® statistical software was used to estimate the RDD, using the rdrobust command, in which the bandwidth is calculated using the algorithm proposed by Calonico *et al.* (2014), through the MSE-optimal function.
2. Kernel triangular is the standard function adopted by the rdrobust command, is nonparametric and the weight of the observations is less, in so far that they are far from the cut-off.
3. Although the means of the logarithm of population size for the two groups (within and out of the sample) differs by less than 2.5%, this means that the population size of municipalities within the sample (close elections) is approximately 20% higher on average when compared to municipalities out of the sample.
4. Stata® statistical software was used to estimate the density, using the rddensity command proposed by the authors.

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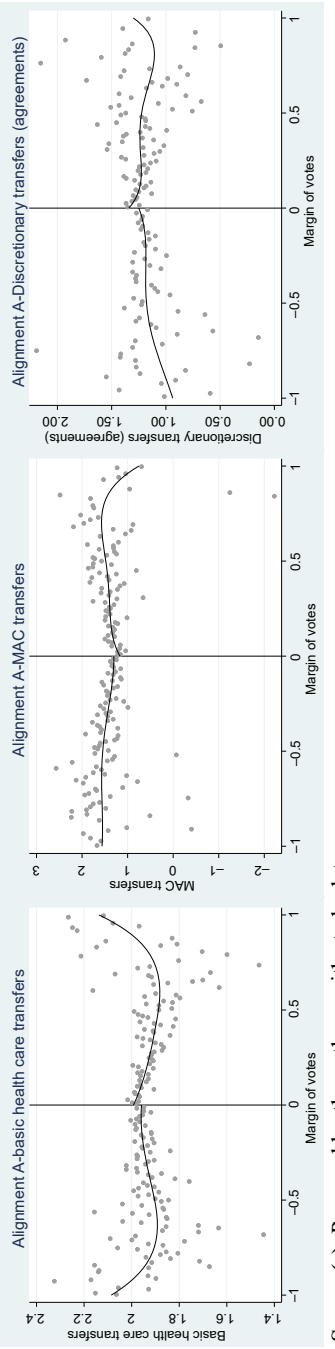
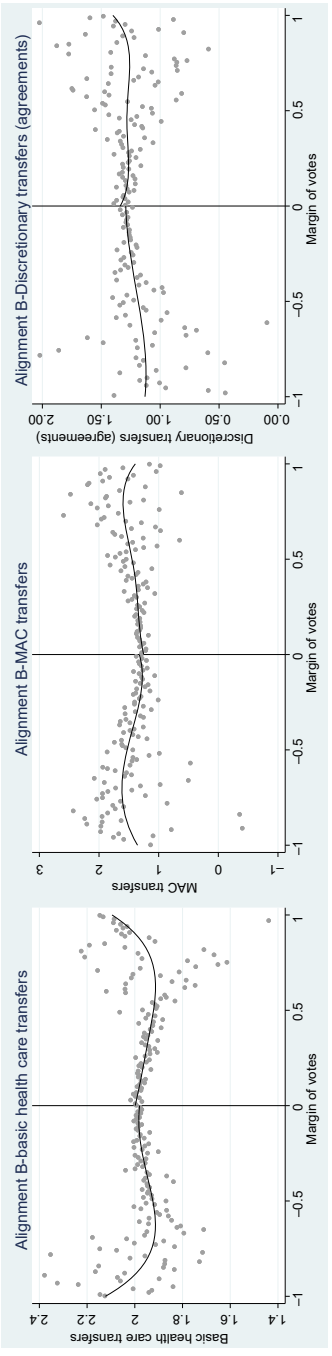
Appendix



Source(s): Prepared by the authors with study data

Figure A1.
Graphic identification of the discontinuity of transfers for mayors from the same party as the president



Source(s): Prepared by the authors with study data

Figure A2.
Graphic identification of the discontinuity of transfers for when the mayor's party was part of the president's coalition

Dependent variable	General mean	Alignment A		Alignment B	
		Mean within the sample	Mean out of sample	Mean within the sample	Mean out of sample
GDP per capita log	9.46397	9.517804	9.44175	9.500561	9.426775
Population log	9.437362	9.556699	9.355619	9.435918	9.366588
FPM resource log	15.93995	16.01426	15.89158	15.9655	15.8815
Infant mortality	15.9962	15.7586	15.9074	15.5787	16.0818
Population density	110.6791	131.971	71.99127	102.7442	70.77499
Health insurance per capita	0.0688704	0.0755265	0.0596963	0.0681974	0.0591275
Extreme poverty	0.2853021	0.2954103	0.2926815	0.2934421	0.2930474

Note(s): (1) The criteria to define close elections are a maximum difference of 10% points in the share of votes. (2) Means related to alignment A are slightly different from those related to alignment B, because both samples include only municipalities in which one of the two candidates (winner and best opponent) was politically aligned with the president, according to the corresponding alignment criteria, and in which the candidates have different alignment status (which may not occur for alignment B). (3) Data sources were IBGE (for GDP, population size and population density), DATASUS (for infant mortality, rate of extreme poverty and health insurance per capita) and FINBRA (Public Finances Data from the Secretary of the National Treasury) for FPM resources. GDP is measured in thousands of Reais *per capita* and FPM in Reais per capita, infant mortality corresponds to the number of stillbirths for thousand live births, and population density corresponds to the number of inhabitants per square kilometer. For Population size, GDP and FPM the logarithm was calculated
Source(s): Prepared by the authors with study data

Table A1.
Comparison between municipalities within the sample (close elections) and municipalities outside the sample

Table A2. Results for mayors from the same party as the president (alignment A) – municipalities with only first round elections

				No controls				With controls			
			Calculated bandwidth		Bandwidth = 10%		Calculated bandwidth		Bandwidth = 10%		
Dependent variable	General mean	Initial no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ
Total SUS fund-to-fund transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.144676	18,672	0.156	0.01912* (0.0103)	11,389	0.02115* (0.01261)	7,917	0.121	0.02089** (0.00992)	9,831	0.02408 ** (0.01082)	7,917
Total SUS transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.186086	18,668	0.190	0.02665*** (0.00932)	12,663	0.03393 *** (0.01237)	7,913	0.129	0.03095*** (0.00985)	9,827	0.03511*** (0.01108)	7,913
Basic health care transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	1.988193	18,664	0.172	0.03905*** (0.00889)	12,276	0.04494*** (0.01132)	7,916	0.098	0.03434*** (0.00899)	7,916	0.0345*** (0.00894)	7,916
MAC transfers *(controls: Population log, FPM resource log and Population density)*	1.289465	9,249	0.130	−0.17506*** (0.06113)	5,079	−0.16565* (0.06991)	3,837	0.129	−0.12002** (0.05569)	4,800	−0.10892* (0.06313)	3,837
Discretionary transfers (agreements) *(controls: Population log, Population density, Health insurance per capita and Extreme poverty)*	1.299761	7,594	0.118	0.11658*** (0.03856)	3,675	0.11925*** (0.04195)	3,160	0.128	0.0798*** (0.03101)	3,912	0.08523** (0.03503)	3,160

Note(s): (1) Levels of significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. (2) The sample size is obtained automatically by the optimal bandwidth selection method and also manually defined at 10 percentage point's bandwidth. (3) The set of control variables includes the logarithm of the population size for all the dependent variables, and then, for each dependent variable, it includes also the variables for which the balance tests suggested unbalance. (4) All the dependent variables correspond to the logarithm of the total value received, measured in thousands of Reais per capita

Source(s): Prepared by the authors with study data

Table A3.
Results for when the mayor's party was part of the president's coalition (alignment B) – municipalities with only first round elections

				No controls					With controls			
			Calculated bandwidth		Bandwidth = 10%			Calculated bandwidth		Bandwidth = 10%	
Dependent variable	General mean	Initial no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ	Band-width	Coefficient	Final no. of observ	Coefficient	Final no. of observ
Total SUS fund-to-fund transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.144676	35,997	0.159	0.01498* (0.00776)	22,689	0.01821* (0.00984)	15,866	0.154	0.01232* (0.00668)	22,689	0.01376* (0.00834)	15,866
Total SUS transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	2.186086	35,993	0.146	0.02135*** (0.0076)	21,719	0.02522*** (0.00912)	15,863	0.146	0.01848*** (0.00661)	21,719	0.02075*** (0.00791)	15,863
Basic health care transfers *(controls: population log, FPM resources log, Health insurance per capita and Extreme Poverty)*	1.988193	35,979	0.143	0.01922 *** (0.01922)	21,710	0.02089** (0.00826)	15,858	0.127	0.0148** (0.00593)	19,636	0.01431** (0.00666)	15,858
MAC transfers *(controls: Population log, FPM resources log and Population density)*	1.289465	18,284	0.123	−0.0563 (0.04268)	9,867	−0.06151 (0.04753)	8,010	0.139	−0.03731 (0.03729)	10,439	−0.03838 (0.04375)	8,010
Discretionary transfers (agreements) *(controls: Population log, Population density, Health insurance per capita and Extreme poverty)*	1.299761	13,218	0.168	0.03481 (0.02433)	8,511	0.05665* (0.03101)	5,735	0.145	0.04203* (0.02176)	8,194	0.05573** (0.02603)	5,735

Note(s): (1) Levels of significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. (2) The sample size is obtained automatically by the optimal bandwidth selection method and also manually defined at 10 percentage points bandwidth. (3) The set of control variables includes the logarithm of the population size for all the dependent variables, and then, for each dependent variable, it includes also the variables for which the balance tests suggested unbalance. (4) All the dependent variables correspond to the logarithm of the total value received, measured in thousands of Reais per capita
Source(s): Prepared by the authors with study data