Income Inequality and Elections' Funding: Evidence from Brazil and Japan

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Abstract

Theoretical political economy models suggest that in more heterogeneous societies, political parties representing different income groups tend to support different public policies. As a result, lobbyists are more willing to contribute to political campaigns to avoid the risk of an unfavorable policy being implemented if the opposing party wins. Therefore, higher income inequality increases private contributions to electoral campaigns. This study examines the impact of income inequality on election costs in Brazil and Japan using panel data from the Brazilian local elections from 2002 to 2016 and from the Japanese House of Councillor's prefectural-tier elections from 1977 to 2016. It also explores different aspects of the effect of income inequality on campaign costs: inequality's spillover effects on campaign donations in Brazil and its effect on different types of electoral expenditures in Japan. All results suggest that more unequal societies tend to have more expensive elections.

Key-words: Campaign Financing; Income Inequality; Elections; Brazil; Japan.
JEL Codes: D31; D72

Resumo

Modelos de economia política sugerem que em sociedades mais heterogêneas, partidos políticos representando diferentes grupos de renda tendem a apoiar políticas públicas diferentes. Como resultado, lobistas ficam mais dispostos a contribuir com campanhas políticas a fim de evitar que uma política desfavorável seja implementada caso o partido rival ganhe as eleições. Portanto, o aumento da desigualdade social causa um aumento nas contribuições de campanhas eleitorais. Este estudo examina o impacto da desigualdade de renda em gastos eleitorais no Brasil e no Japão com dados dados de painel das eleições municipais brasileiras de 2004 à 2016 e das eleições para a Casa dos Conselheiros do Japão de 1977 à 2016. Também são explorados diferentes aspectos do efeito da desigualdade em gastos eleitorais: os efeitos de *spillover* da desigualdade em doações de campanha no Brasil e seus impactos em diferentes tipos de gastos eleitorais no Japão. Todos os resultados sugerem que sociedades mais desiguais tendem a ter eleições mais caras.

Key-words: Financiamento de campanhas; Desigualdade de renda; Eleições; Brasil; Japão.
Códigos JEL: D31; D72

1 Introduction

In most OECD countries, income inequality has reached record levels (Cingano, 2014). Lakner and Milanovic (2013) show that global inequality has slightly decreased between 1988 and 2008, but when under-reported top-incomes are included, the decline almost disappears. Furthermore, whereas the Gini index between countries remained stable, inequality within countries has increased. Nevertheless, inequality has risen in developed countries and has been historically high in Latin American countries like Brazil.

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Income inequality can affect social outcomes through several mechanisms. Mattos and Rocha (2008) show how it can positively affect the size of states in Brazil, and Buonanno and Vargas (2019) investigate how high inequality levels increase crime rates in Colombia. Mainly in the 90s, economists have tried to investigate how inequality affects economic growth[1]. Some find positive effects (Forbes, 2000), some find mixed effects, depending on one's country level of development (Barro, 1999), but a majority find negative effects (Persson & Tabellini, 1994; Alesina & Rodrik, 1994; Benabou, 1996; Aghion, Caroli, & Garcia-Penalosa, 1999; Cingano, 2014). Although the results are mixed, it became clear that inequality is an important variable for better understanding economic and social phenomena.

There is also a vast literature linking income inequality and institutions. Acemoglu and Robinson (2000, 2002) propose a political economy model relating inequality to political enfranchisement. Rogowski and MacRae (2004) develops a model to describe how inequality and institutions can be affected by exogenous changes. Engerman and Sokoloff (2002) and Chong and Gradstein (2007) are a few examples of how inequality can affect institutional quality. Finally, Kawanaka, Hazama, et al. (2016) shows how in young democracies, factors such as multiple social cleavages, information constraints and weak state capacity can dampen the effects of democratization on inequality.

Economists became well aware that income inequality is important for the rise and well functioning of democratic systems. However, once democracies are established, understanding how the government is chosen and how inequality can affect people's choices is not as simple as just counting votes. Institutional quality is associated with the electoral process, which in turn is connected to electoral campaigns and campaign financing. Furthermore, Lobbies and their ability to influence voters and those in power play a central role in all democracies. Downs (1957) had already observed that in a world of imperfect information, interest groups can persuade voters. Influencing beliefs and ideas in elections, however, would not be as we know them without campaign financing. Hence, campaign donations are a key component to understand how democracies work.

Although inequality and campaign financing are important factors that determine institutional quality, there is a lack of evidence on the relationship between both variables. More recently, a new literature has been trying to investigate the relationship between inequality and the cost of electoral campaigns considering the effects of interest groups. Bugarin, Portugal, and Sakurai (2011) present a political model and show how inequality can affect election costs. The model predicts that more unequal societies tend to have more expensive electoral campaigns. They test this hypothesis for Brazil's local and national legislative elections and find a positive relationship between the Gini index and campaign expenditures. Bugarin (2012) and Bugarin (2015) test the same hypothesis for Japan's Upper House elections and the results confirm the theoretical predictions. Finally, Bugarin and Tanaka (2018) explore the impacts of income inequality on electoral campaign financing for Brazil's 2012 local elections. Again, they find a positive relationship between the Gini index and campaign costs.

This study extends the work of Bugarin (2012) and Bugarin (2015) by using updated data for Japan's Upper House elections and introducing for the first time panel data for the Brazilian local elections. Besides confirming the effects previously found, we bring two novelty findings to the literature. For Brazil, we consider the effects of spatial spillover effects on donations. For Japan, we explore a new database to investigate how income inequality can affect different types of campaign expenditures. All calculations were made using the software STATA 14.

The rest of this paper is organized as it follows. Section 2 describes the political model developed by Bugarin (2012). Section 3 describes the panel used for the Brazilian elections for local representatives and presents the fixed effects estimations results. Section 4 describes the updated data for Japan and outlines the new database containing expenditures per category and presents the estimation results for Japan. In section 5 we try to address the possible spillover effect of campaign costs. Finally, section 6 concludes by summarizing the main results and discussing some key implications for future policy.

[1] In a seminal paper, Kuznets (1955) proposed the symmetrical question and suggested an inverted U shaped relation between inequality and economic development. According to Kuznets, income inequality levels would increase as a country developed economically and decrease latter on.

2 The Model

This section briefly explains the model used by (Bugarin, 2015). For the mathematical details, see (Bugarin et al., 2011), (Bugarin, 2012) and (Bugarin, 2015). The model is an electoral competition game between parties, lobbyists and voters. It assumes that voters belong to two different social classes: ”Rich” and ”Poor”. Two political parties that represent those classes compete declaring a certain per capita amount of a public good. A voter's utility function depends on the consumption of a private good and on the consumption of the public good.

The poor and the party that represents their social class prefer a greater amount of the public good than the rich. Intuitively the rich pay relatively more taxes, meaning that they prefer lower public output. However, political parties face a trade-off: they might be willing to deviate from their preferred policies in order to obtain more votes from the other social class and increase their chances to win the elections.

Political parties can choose a platform that is similar to their ideological preferences and receive more votes from their “native” classes. At the same time, they can influence the other social class through electoral campaigns using funds obtained from donations.

The main result of the model is that the greater the income inequality, the more lobbyists will be willing to contribute to political parties. Intuitively, more inequality means that the rich and the poor have different preferences for the public good, which in turn allows for parties to deviate from their ideology in order to obtain votes from the other social class. Lobbyists from each class, however, foresee the risk that a policy very different from their preferred one might be implemented if the other party wins the elections. As a result, lobbyists become more willing to finance their own party, resulting in more expensive campaigns.

3 Brazil

Brazil is currently a federal republic composed of 26 states and one federal district. Each stated is composed of municipalities (5570 in total) that are also considered members of the federation. They have autonomy to legislate and to implement public policies by their own, meaning that both states and municipalities have executive and legislative branches.

The executive branch of a municipality is represented by a mayor, whereas the legislative is represented by a unicameral local chamber. Every four years, voters have to choose one mayor and a number of local representatives[2]. For small municipalities, mayors are elected using a simple majority system. However, for municipalities with a population bigger than 200.000 people, a second-round system is used, meaning that if one candidate does not receive more than 50% of the valid votes, a second round is held between the top two candidates. Mayors can run for re-election, but not for three consecutive terms. Local representatives are elected using single voter proportional system and there are no term limits.

Campaigns are privately and publicly financed. Public resources mainly include transfers from the Campaign Party Fund (*Fundo Partidário*) and private resources include donations from individuals and from private companies. Donations from the latter were prohibited from 2016 on. That was compensated by an increase on the amount of public funding.

This study uses a panel covering 4 Brazilian municipal elections (2004 to 2016) that contains aggregate electoral contributions and expenditures for candidates running for municipal assembly representatives (local representatives). Each candidate is required the declare his or her electoral revenue and expenditure to the Brazilian Electoral Management Body (TSE - *Tribunal Superior Eleitoral*), where the data was taken from. To the best of our knowledge, this is the first time panel data for Brazilians municipalities is used to estimate the relationship between income inequality and campaign financing.

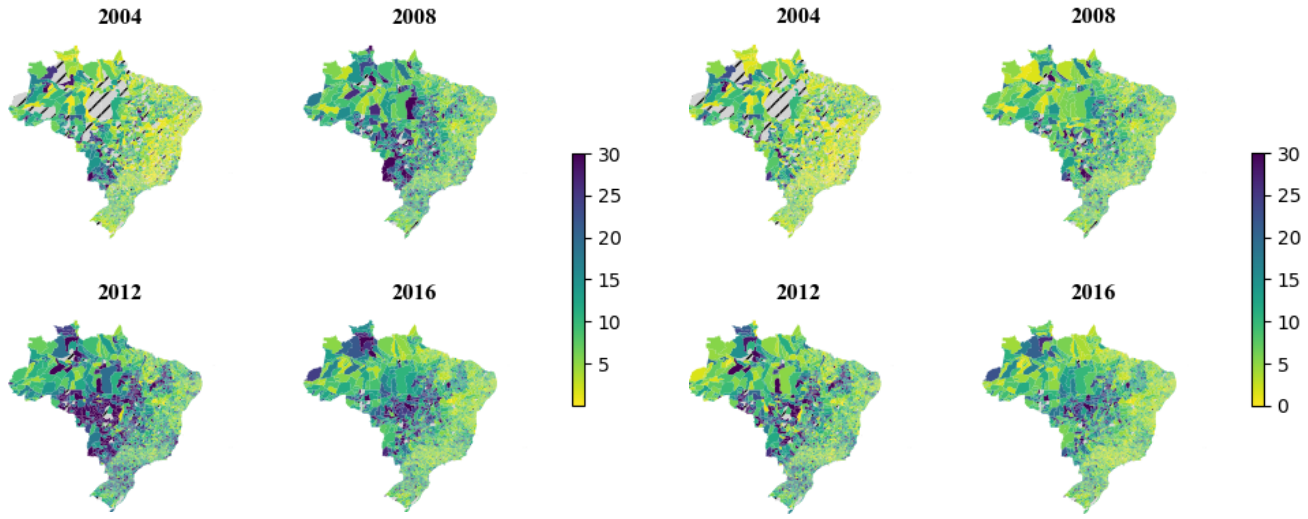
3.1 Dependent Variables

To obtain the dependent variables, the per-candidate data was aggregated by municipality according to the year an election was held to obtain the variable total private donations per municipality. Private donations

[2]From 9 to 55, depending on the municipality's population.

include resources from the own candidate and donations from individuals and companies. The monetary values where then deflated to Brazilian Reais of 2012.

Figure 1: Campaign expenditure and private donations per voter - Local representatives



(a) Total campaign expenditure per voter

(b) Total private donations per voter

Source: TSE.

Figure 1 plots total expenditure per voter and total private donations per vote by municipality in constant 2012 Brazilian Reais. Both graphs suggest that elections in the Northern and Center Western regions where more expensive in per voter terms.

To obtain the dependent variables used in the study, we divided the total private donations by the municipality's population and the number of voters in the municipality (in thousands) and took the natural logarithm to form the variables **Don/Hab** and **Don/Vot**. The demographic data was taken from the population estimates calculated by the Brazilian Institute of Geography and Statistics (IBGE - Instituto Brasileiro de Geografia e Estatística), while the number of voters and seats were obtained from the TSE. Table 1 contains the summary statistics for these variables. To avoid loss of observations due to municipalities with no private donations, we added 1 to all previous variables.

Table 1: Summary statistics for the dependent variables

	Obs.	Mean	Std	Min	25%	50%	75%	Max
Don/Vot	21526	8.74	1.09	0	8.28	8.83	9.36	14.14
Don/Hab	21526	8.46	1.11	0	7.97	8.54	9.1	13.78

Source: author.

3.2 Explanatory Variables

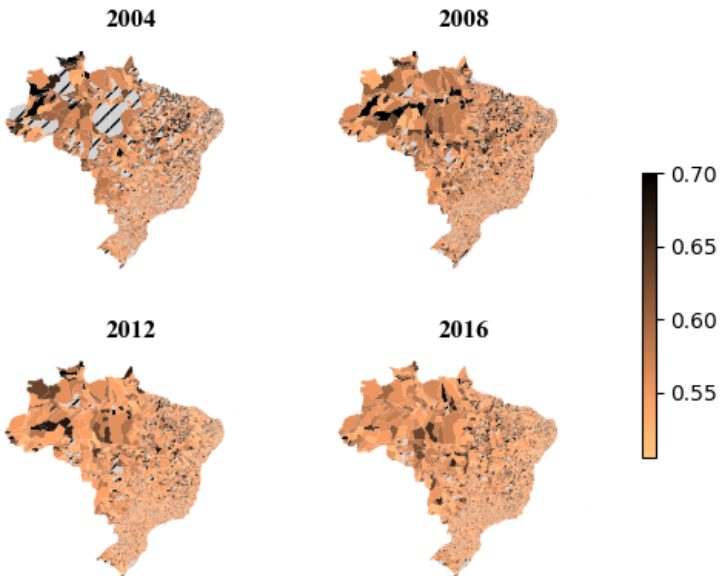
The main explanatory variable is the Gini coefficient. According to the theoretical model developed by Bugarin (2012), there should be a positive relationship between the Gini and the cost of elections. However, the Gini index for Brazilian municipalities does not match the municipal election years. Hence, this thesis uses income data from the RAIS database to calculate the Gini coefficients [3]. RAIS is a database that covers

[3]The Gini Indexes for Brazil's municipalities were estimated using relative mean difference for ordered data (Dixon, Weiner, Mitchell-Olds, & Woodley, 1987; Damgaard & Weiner, 2000).

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)x_i}{n\sum_{i=1}^{n} x_i} \tag{1}$$

all municipalities in Brazil and contains detailed data on formal workers. Given the size of the informal economy in Brazil, the Gini coefficient based on the formal sector might not be an exact measurement of the real income inequality. Nevertheless, given the limitations imposed by the data available, it is used here as a proxy. Figure 2 shows the calculated Gini coefficients for Brazilian municipalities for the election years. It suggests greater income inequality in the Northern region, although Brazil is quite unequal in general.

Figure 2: Gini coefficients for Brazilian municipalities



Source: RAIS and author's calculations.

Because this study uses fixed effects, time invariant variables could not be used. Therefore not all the remaining explanatory variables described below are the same used by Bugarin (2012, 2015) and Bugarin and Tanaka (2018), who performed OLS regressions for Brazil's municipalities. Table 2 contains the description for all independent variables. Table 3 contains summary statistics for all explanatory variables.

The controls are a set of demographic and electoral variables. The number of candidates, seats, voters and incumbents was included, as district size and incumbents can affect campaign financing (Taylor, Herrnson, & Curry, 2017; Weinschenk & Holbrook, 2014). Bugarin (2012, 2015) and Bugarin and Tanaka (2018) also include a municipality's GDP and urban population. Cox and McCubbins (1986) supports that campaigns can be viewed as promises for welfare redistribution, and that politicians will prioritize their support groups. Kitsos and Proestakis (2021) and Livert and Gainza (2017) find evidence that intergovernmental transfers between national and local governments might play a role in pork-barrel activities: transfers are higher for municipalities politically aligned with the central government. Because more resources for public spending in an election year might affect campaign costs, we also include political alignment control variables.

Table 2: Explanatory Variables

Variable	Description
Gini	The natural logarithm of the Gini coefficient obtained from the RAIS database.
Income	The natural logarithm of the per capita municipal income in constant 2012 Brazilian Reais. The municipalities' incomes where obtained from the Brazilian Institute of Geography and Statistics.
GiniIncome	The product of the Gini and the log of the municipality income. It controls for the effect of inequality on electoral expenditures as the municipality grows.

Continued on next page

Where G is the Gini Index, x is an observed income value, n is the number of values and i is the rank of the values in ascending order. To obtain an unbiased estimator, the values were multiplied by $n/(n-1)$.

Table 2 – *Continued from previous page*

Variable	Description
Education Frag	The population educational fragmentation index. This variable is a proxy for how heterogeneous the electorate is in educational terms. The index is calculated as $1 - \sum_{j=1}^{8} \varepsilon_j^2$ where ε_j is the proportion of voters in class *j* of 8 different educational levels. The educational levels were taken from the TSE. This variable indicates the educational level of voters at the moment they register for the first time or when they update their registration. If all voters have the same level of instruction, the educational frag index should be 0. On the other hand, the variable takes high values if all educational levels are well represented among voters.
Young	The percentage of voters between 16 and 17 years old in the municipality. Voting is compulsory in Brazil for all citizens 18 years old or older. However, it is optional for teenagers between 16 and 17 years old.
Senior	The percentage of senior voters, above 70 years old in the municipality. Senior citizens are not obligated to vote in Brazil. Both the Young and Senior variables were collected from the TSE.
AgeFrag	The age fragmentation index of the voters. It is a proxy for how heterogeneous the electorate is in terms of age span. The index is calculated as $1 - \sum_{j=1}^{11} v_j^2$ where v_j is the proportion of voters in age class *j*, of 11 different age classes. Like the education fragmentation index, the higher the index, the more heterogeneous the voters are in terms of age groups.
Urban	The urban population (in thousands) of the municipality.
Candidates	The number of candidates running for local representative and their squares.
Voters	The number of voters (in thousands) in the municipality.
Seats	The number of local representative legislature seats under dispute.
Incumbent	It is the number of representatives running for reelection. It is expected that incumbents would reduce the cost of elections due to incumbency advantages.
Pres Alignment	A dummy that takes the value 1 if the mayor at the time of the elections is from the same party as the president.
Gov Alignment	A dummy that takes the value 1 if the mayor at the time of the elections is from the same party as the state governor.
PresGov Alignment	A dummy that takes the value 1 if the mayor at the time of the elections is from the same party as the president and the state governor.

Source: author.

Table 3: Summary statistics for Explanatory Variables

	Count	Mean	Std	Min	25%	50%	75%	Max
Gini	21526	-0.47	0.08	-0.6	-0.52	-0.49	-0.44	0
Income	21526	14.07	16.41	-1.46	5.74	10.23	17.05	777.1
GiniIncome	21526	-6.75	8.25	-419.81	-8.37	-4.85	-2.61	0.74
EducationFrag	21526	0.75	0.04	0.45	0.73	0.76	0.78	0.86
Young	21526	0.04	0.01	0	0.02	0.03	0.04	0.1
Senior	21526	0.07	0.02	0.01	0.06	0.07	0.08	0.2
AgeFrag	21526	0.84	0.01	0.78	0.83	0.84	0.84	0.87
Urban	21526	29.29	203.57	0.17	2.87	6.37	15.86	11929.83
Candidates	21526	2.93	1.28	1	2	3	3	16
Candidates2	21526	10.09	10.86	-112	4	9	9	121
Voters	21526	24.24	148.01	0.83	4.29	8.24	17.02	8886.32
Incumbent	21526	0.49	0.5	0	0	0	1	1
PresAlignment	21499	0.08	0.27	0	0	0	0	1
GovAlignment	21499	0.19	0.39	0	0	0	0	1
PresGovAlignment	21499	0.02	0.15	0	0	0	0	1

Source: author.

3.3 Econometric Specification and Results

This section presents the results for Brazil's local elections for local representatives. POLS, random effects and fixed effects specifications were tested. However, only the fixed effects models are shown, as the Chow test, the Breusch-Pagan test and the Hausman test indicated that the best fitting model was the fixed-effects specification. Furthermore, the error term was clustered at the municipality level, as the modified Wald test for groupwise heteroskedasticity in fixed effects models suggested the presence of heteroskedastic errors.

All models for Brazil are variations of the following econometric specification:

$$y_{i,t} = \alpha + \beta Gini_{i,t} + \Gamma_1 CON_{i,t} + \Gamma_2 Y_{i,t} + \mu_i + \epsilon_{i,t} \tag{2}$$

Where $y_{i,t}$ denotes either an aggregate campaign expenditure or revenue variable in municipality i in the year t. $Gini_{i,t}$ is the Gini index in municipality i in the year t and β is the coefficient of interest, which we expect to be positive. $CON_{i,t}$ is a vector of control variables and $Y_{i,t}$ is a vector of year dummies. Both vectors have its corresponding coefficient vectors Γ_1 and Γ_2. μ_i captures a time-invariant individual effect, α is the constant and $\epsilon_{i,t}$ the error term.

Table 4 shows the main results for the mayoral elections. The dependent variables for regressions 1 and 2 are respectively: private donations per voter and private donations per citizen. In all cases, an F test for the year dummies indicated that the year fixed effects should the kept in the models.

As expected, the estimated coefficient for the Gini index is positive and statistically significant when the dependent variable is the logarithm of private donations, meaning that inequality affects campaign donations positively. This effect seems to be stronger in per voters terms, as regressions 1 exhibits bigger coefficients than regressions 2. In our specification, both the $Gini$ variable and the dependent variable are in natural logs, meaning that it is possible to interpret the estimated coefficients as coefficients of elasticity. An increase of 10% in the Gini index represents a $1.1^{0.40-0.01*ln(Income)}$% change in private donations per thousand voters. Using the average value of $ln(Income)$ (14), an increase of 10% in the Gini index increases private donations by 3.8%.

Although the specification used here is not exactly the same used in previous studies due to the use of panel data (all previous studies for Brazil were cross-sectional analysis), the main results are in line with Bugarin (2015) and Bugarin and Tanaka (2018).

$GiniIncome$ has a negative coefficient and $Income$ has a positive one, meaning that the effect of the Gini index tends to diminish slowly as municipalities become richer. $EducationFrag$ also has a positive coefficient, suggesting that citizens from less educationally homogeneous municipalities tend to donate more. We believe that this reinforces our main results, as income inequality and educational fragmentation are highly related. The number of candidates is also positively correlated with campaign costs. This is expected, as more candidates represent more competition, increasing the cost of elections, although this effect slowly decreases, as $Candidates2$ has a negative coefficient.

The variable, $Incumbent$ has a positive sign for regressions 1 and 2. One explanation is that incumbency might be increasing competition, as 1 extra candidate is quite a large addition to most municipalities. Another possibility is that some incumbents foresee that they might lose and tend to spend more on their campaigns, causing supporters to increase their donations. In this case, non-reelected mayors dominate the reelected in terms of private contributions.

As for the political alignment variables, only $PresGovAlignment$ is positive and significant. Initially, we would expect that if the current mayor is from the same party as the state governor or the president, campaign costs would be reduced, as the president or governor can transfer public resources to his or her allies in municipalities. A possible explanation is that between 2004 and 2016, all presidents were from the same party (the Worker's Party, or PT). Therefore, $PresGovAlignment$ is also a dummy that indicates whether the mayor and the governor are from the worker's party or not. Given the political alignment with both federal and state governments, candidates from the opposition might have had to spend more resources in order to get elected in such municipalities.

Table 4: Local representative Elections. Results - Fixed Effects

	(1) Don/Vot	(2) Don/Hab
Gini	0.40**	0.30*
	(0.16)	(0.16)
GiniIncome	−0.01	0.00
	(0.01)	(0.01)
Income	−0.00	0.00
	(0.01)	(0.01)
EducationFrag	2.20***	2.34***
	(0.57)	(0.56)
Young	2.95	2.41
	(2.15)	(2.12)
Senior	−1.71	0.83
	(1.18)	(1.17)
AgeFrag	1.99	4.10
	(3.01)	(3.00)
Urban	−0.00	−0.00**
	(0.00)	(0.00)
Candidates	0.00**	0.00**
	(0.00)	(0.00)
Candidates2	0.00	0.00
	(0.00)	(0.00)
Voters	−0.00**	−0.00
	(0.00)	(0.00)
Seats	−0.04**	−0.05***
	(0.02)	(0.02)
Seats2	0.00	0.00
	(0.00)	(0.00)
Incumbent	0.14***	0.15***

Continued on next page

Table 4 – *Continued from previous page*

	15) Don/Vot	(2) Don/Hab
	(0.04)	(0.04)
PresAlignment	−0.01	−0.01
	(0.03)	(0.03)
GovAlignment	0.00	0.00
	(0.02)	(0.02)
PresGovAlignment	0.14***	0.15***
	(0.05)	(0.05)
Constant	5.25**	2.96
	(2.47)	(2.46)
Obs.	21499	21499
$R^2within$	0.173	0.203
$R^2overall$	0.048	0.044
$R^2between$	0.004	0.004
σu	0.834	0.919
σe	0.854	0.845
ρ	0.487	0.542
Year FE	Yes	Yes

Models for local representatives elections - Fixed Effects. The dependent variables are: Don/Vot - donations per voter, Don/Hab - donations per citizen. Robust standard errors in parenthesis, *p $<$ 0.1, **p $<$ 0.05, ***p $<$ 0.01. Source: author.

Besides using data from local representative elections, we also estimated the same regressions for local mayor elections and used estimated deduction values (*baixa de recursos estimáveis*) as an alternative measurement for campaign expenditure. Estimated deduction values are part of one candidate's total expenditure, but unlike regular costs, they represent estimated values of goods and services donated by a natural or a juridical person. An example would be offering printing services for a candidate but not charging for it. The results[4] are very similar in all cases, reinforcing the results obtained for local representatives and the ones previously observed in the literature.

4 Japan

The National Diet, Japan's postwar parliamentary monarchy highest organ, is formed by a Lower House (the House of Representatives) and an Upper House (the House of Councillors)[5].

The Upper House was created in 1947 as a substitute for the House of Peers (*kizokuin*), and election rules for its members have gone through several changes since it was founded. The House holds elections every 3 years and members serve six-year terms, so that half of the seats are renovated every election. Voters cast two votes: one for a local prefectural district and other for a national district. Since it was established, about 60% of its members have been elected from Japan's forty-seven prefectures by the SNTV (single non-transferable vote) rule[6]. The remaining seats were disputed in a single national district under SNTV.

Since 1994, parties are both publicly and privately funded. Public funds are provided directly to parties (and not to candidates), but can only be used for day-to-day expenses, not for electoral campaigns. Furthermore, candidates have a limit on how much they can spend on campaigns, and have to report on their campaign finances.

[4]Results available upon request.

[5]In a rough comparison with the British Parliament, the House of Representatives and the House of Councillors would be equivalent to the House of Commons and the House of Lords, respectively.

[6]The number of seats under dispute in each prefecture varies with its size. For exemple, in 2016, Tōkyo elected 6 representatives, but Kyōto elected only 2.

In accordance with Bugarin (2012) and Bugarin (2015), this study uses updated campaign expenditure data from 1977 to 2016, covering most changes in the election systems of both houses. However, the database only contains information from the House of Councillors' SNTV prefectural elections, whose rules remained stable throughout the period. The Gini coefficients are calculated by the Ministry of Internal Affairs and Communications through the National Survey of Family Income and Expenditure. Overall, the data covers 14 elections. Because each prefecture represents one entity, the full data set contains 658 observations. Furthermore, this is the first study to estimate the impact of income inequality on different categories of electoral costs.

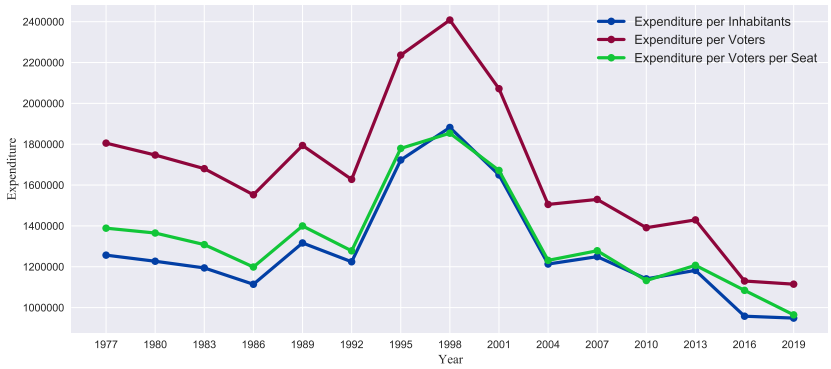
4.1 Dependent Variables

The main variable is the House of Councillors' elections electoral expenditure aggregated by prefecture (*todoufuken*) from 1977 to 2016. The data is provided by the Report on the Result of the Elections for the House of Councillors (RRE, *Sangiin tsujō senkyo kekka shirabe*), published by the Japan Statistics Bureau, Ministry of Home Affairs and Communication. It contains information on each candidate's electoral campaign expenditure in Japanese yen. The individual expenditures were aggregated by prefecture for each electoral year and deflated to constant yens of 2005 using the Consumer Price Index calculated by the Statistics Bureau of the Government of Japan (JSB).

Figure 3 indicates that excluding the period between 1995 and 2001, campaign expenditures exhibit a fairly stable behavior in constant yens. In 2016, the prefectures of Tottori and Shimane and the prefectures of Tokushima and Kōchi held combined elections for the Upper House. That means Tottori and Shimane formed one at-large district (Tottori-Shimane at-large district) and the election was held as if both prefectures were only one. The same applies for Tokushima and Kōchi. For this reason, this study excluded these four prefectures from the main estimations.

Three different dependent variables were used for the regressions. They are the same used by Bugarin (2012, 2015) and were all based on the base 10 logarithm of campaign expenditures in constant yens of the following variables:
Exp: the constant expenditure divided by the prefecture population in thousands at the same election year. **ExpV**: the constant expenditure divided by the number of elective voters in thousands in the prefecture at the election year. **ExpVS**: the ExpV divided by the number of seats available in the election for each prefecture. The populational data was collected from the Japan Statistical Yearbook (JSB).

Figure 3: Campaign expenditure for the Japanese Upper House.



Local constituencies, 1977-2016 in constant 2005 Japanese yen. Source: Report on the Result of the Elections for the House of Councillors

Table 5 contains the summary statistics for the campaign expenditures.

Table 5: Summary statistics - dependent variables

	Obs.	Mean	Std	Min	25%	50%	75%	Max
Exp	602	10.05	0.41	8.56	9.77	10.07	10.3	11.25
ExpV	602	10.31	0.42	8.78	10.03	10.35	10.58	11.51
ExpVS	602	9.93	0.74	7.98	9.42	10.06	10.48	11.51

Source: author.

4.2 Explanatory Variables

The main explanatory variable is the Gini coefficient. According to the theoretic model described in section 2, we expect to see a positive relationship between the Gini coefficient and the electoral campaign expenditures, meaning that the more unequal a prefecture is, the more expensive campaigns should be. The Prefectural Gini coefficient is calculated by the Ministry of Internal Affairs and Communications through the National Survey of Family Income and Expenditure every five years. However, the House of Councillors elections are held every three years. That means there is no perfect match between the Gini coefficients and the electoral data. Therefore, this thesis calculates the weighted average for the Gini coefficients (Adjusted Gini) for the years in between the release of the National Survey of Family Income and Expenditure.

All explanatory variables are described in table 6 and are exactly the same used by Bugarin (2012, 2015). Table 7 contains descriptive statistics for all the explanatory variables.

Table 6: Explanatory Variables

Variable	Description
Gini	The natural logarithm of the prefecture's adjusted Gini coefficient.
GDP	The natural logarithm of the prefecture's GDP in constant 2005 billion yens.
Inv	The natural logarithm of the prefecture investment in constant 2005 billion yen. This variable was included to confirm the hypothesis that private owned companies that benefit from prefectural investments are more willing to donate to political campaigns the higher the investment is.
Unemp	Unemployment rate in the prefecture. This variable controls for the possibility that elections in prefectures with higher unemployment rates are more costly. The prefectural unemployment rates are calculated and released by the JBS every 5 years. For this reason, like the Gini coefficients, there is no match between the electoral data and the unemployment rates. Therefore, weighted averages were calculated for the intermediate years.
Aid	Number of people receiving public livelihood assistance per 1000 prefecture inhabitants. It controls for the likelihood that the amount of people receiving public aid might affect the election's cost. The data was calculated based on the Japan Statistical Yearbook.
Pop	Prefecture's population in thousands.
Farm	Percentage of farmer households over total population. From the end of the Second World War to the 90s, LDP members typically offered protection to small farmers in return of electoral support. Therefore, farmers' incomes have been especially vulnerable to changes in politics.
Urban	Percentage of urban area over total prefecture area. This variable is used as a proxy for urban population.
Voters	The number of voters (in thousands) in the prefecture.
Candidates	Number of candidates running for an Upper House Seat in each prefecture and its square.

Continued on next page

Table 6 – *Continued from previous page*

Variable	Description
Seats	Number of seats up for election in each prefecture and its square. Note that the number of seats varies for prefectures over time (otherwise it would not be possible to include this variable in the fixed-effects regressions).

Source: author.

Table 7: Summary statistics for explanatory variables

	Obs.	Mean	Std	Min	25%	50%	75%	Max
Gini	602	-1.24	0.07	-1.46	-1.29	-1.23	-1.2	-0.98
GDP	602	8.8	0.83	7.18	8.2	8.61	9.24	11.53
Inv	602	6.38	0.64	5.01	5.92	6.28	6.75	8.61
Unemp	602	3.94	1.9	0.5	2.5	3.7	5.16	12.5
Aid	602	10.03	6.36	1.59	5.24	8.56	12.98	39.5
Pop	602	2816.69	2511.12	782.41	1235	1841.5	2881.25	13623.94
Farm	602	15.29	10.6	0.14	6.91	12.84	22.41	58.35
Urban	602	42.67	21.44	10.52	26.59	36.81	59.27	93.72
Voters	602	1259.56	1070.65	283	605.25	849.25	1301.5	6415.55
Cand	602	5.14	3.3	2	3	4	6	31
Cand2	602	37.25	76.32	4	9	16	36	961
Seats	602	1.65	0.85	1	1	1	2	6
Seats2	602	3.44	3.99	1	1	1	4	36

Source: author

4.3 Expenditure per Category

We also run regressions for campaign costs according to their uses. In Japan, campaign expenditures can be divided in 11 categories. **Personnel** expenses include payment for office personnel, sign language interpreters and other workers involved in one candidate's campaign. **Election Office** includes the cost of renting office space and furniture. **Convention** costs comprise costs related to conventions in the campaign period. **Communication** expenses include postal rates, phone, FAX and internet bills. **Transportation** includes rental car costs and train tickets. **Printing** comprises posters and postcards printing fees. **Advertisement** includes campaign advertising in media, such as newspapers and billboards. **Stationary** includes office supplies. Snacks and lunch costs (bentō) are categorized as **Food** expenses. **Rest** includes accommodation costs. Finally, the category **Other** comprises every expense that cannot be classified in the described categories, such as electricity, water bills, gas bills etc.

The distribution of campaign expenditures remained relatively stable over the years, although Advertisement and Others gained more importance in detriment of Transportation, Communication and Food. Overall, most part of one candidate's budget goes to Personnel, Election Office, Printing and Advertisement, while other categories have a smaller share in the total expenditure.

While types of expenditure are highly correlated between each other, the Adjusted Gini seems to be more correlated with Election Office, Conventions, Advertisement and Others. Clearly, simple correlations should not be interpreted as causative. Nevertheless, it illustrates the possibility that one type of expenditure might be driving the results.

4.4 Econometric Specification and Results

This section presents the fixed-effects estimations for Japan's Upper House elections and for each type of expenditure. POLS, random effects and fixed effects specifications were tested. However, only the fixed effects models are shown, as the Chow test, the Breusch-Pagan test and the Hausman test indicated that the best fitting model was the fixed-effects specification. Furthermore, the error term was clustered at the prefectural level, as the modified Wald test for groupwise heteroskedasticity in fixed effects models suggested the presence of heteroskedastic errors.

All models for Japan are variations of the following econometric specification:

$$y_{i,t} = \alpha + \beta Gini_{i,t} + \Gamma_1 CON_{i,t} + \Gamma_2 Y_{i,t} + \mu_i + \epsilon_{i,t} \tag{3}$$

Where $y_{i,t}$ denotes an aggregate campaign expenditure variable in prefecture i in the year t. β is the coefficient of interest. $CON_{i,t}$ is a vector of control variables and $Y_{i,t}$ is a vector of year dummies. Both vectors have its corresponding coefficients vectors Γ_1 and Γ_2. μ_i captures a time-invariant individual effect, α is the constant and $\epsilon_{i,t}$ the error term.

4.5 Upper House

The results for the Japanese Upper House elections are shown in table 8. Regression 9 uses the natural logarithm of the constant campaign expenditure in constant 2005 Japanese yen as the dependent variable. The remaining regressions use the same dependent variable, but divide it by the number of voters (regression 10) or the number of voters per seat (regression 11). All regressions include year dummies for all years except 1977. As the prefectures of Tottori & Shimane and Tokushima & Kōchi held combined elections in 2016, the models exclude these prefectures, but the results are not greatly affected if the same regressions are estimated by averaging the dependent and independent variable values for both pairs of prefectures. All regressions had their errors clustered at the prefectural level.

The specifications used here slightly differs from the one used in Bugarin (2015) in the sense that both the $Gini$ variable and the dependent variables are in natural logs. That makes it possible to interpret the estimated coefficients as elasticities. Regression 9's coefficient of 0.69 tells us that an increase of 1% in the Gini index represents a 0.69% change in electoral expenditure by a thousand inhabitants. Overall, the results are similar to the ones found previously in the literature. The Adjusted Gini estimated coefficient is positive and significant for all cases even when including time fixed effects.

Table 8: Japanese Upper House Elections - Fixed Effects

	(3)	(4)	(5)
	Exp	ExpV	ExpVS
Gini	0.69**	0.67**	0.66**
	(0.27)	(0.27)	(0.26)
GDP	−0.26	−0.27	−0.25
	(0.19)	(0.19)	(0.19)
Inv	0.05	0.04	0.03
	(0.06)	(0.06)	(0.06)
Unemp	0.00	−0.00	0.00
	(0.02)	(0.02)	(0.02)
Aid	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Pop	−0.00***	−0.00***	−0.00***
	(0.00)	(0.00)	(0.00)
Farm	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
Urban	−0.00	−0.00	−0.00

Continued on next page

Table 8 – *Continued from previous page*

	(3) Exp	(4) ExpV	(5) ExpVS
	(0.00)	(0.00)	(0.00)
Voters	0.00*	0.00**	0.00*
	(0.00)	(0.00)	(0.00)
Cand	0.17***	0.17***	0.17***
	(0.02)	(0.02)	(0.02)
Cand2	−0.00***	−0.00***	−0.01***
	(0.00)	(0.00)	(0.00)
Seats	−0.17*	−0.20**	−1.13***
	(0.10)	(0.10)	(0.11)
Seats2	0.07***	0.07***	0.16***
	(0.02)	(0.02)	(0.02)
Constant	12.87***	13.41***	14.18***
	(1.69)	(1.69)	(1.68)
$obs.$	602	602	602
R^2_a	0.555	0.594	0.601
$R^2within$	0.574	0.611	0.629
$R^2overall$	0.615	0.610	0.880
$R^2between$	0.738	0.734	0.937
σ_u	0.282	0.313	0.293
σ_e	0.193	0.194	0.194
ρ	0.681	0.722	0.697
Year FE	Yes	Yes	Yes

Models for the House of Councillors - Fixed Effects. The dependent variables are: Exp - constant expenditure per citizen, ExpV - constant expenditure per voter, ExpVS - constant expenditure per voter per seat. Robust standard errors in parenthesis, *p $<$ 0.1, **p $<$ 0.05, ***p $<$ 0.01. Source: author.

The insignificance of the unemployment rate may result from the use of linear estimators (weighted averages) for the unemployment rates in years where no data was available. It also may suggest that electoral campaigns for the Upper House are only slightly sensitive to a prefecture's unemployment rate. However, it is important to restate that the dependent variables are electoral costs for the House of Councillors' SNTV prefectural elections, and not for the National District elections. Fighting unemployment is typically considered a nationwide policy, and SNTV prefectural candidates have to compete for votes locally.

$Voters$ and $Cand$ increase the cost of of elections, and $Seats$ decreases it, although both $Cand$ and $farm$ have inverse quadratic effects. The insignificance of the variable Farmer for most regressions and the negative sign for regression 16 might due to the fact that the Liberal democratic Party (LDP), that has dominated Japan's politics since the post-war, is traditionally stronger in rural areas, making the competition there less intense.

4.6 Expenditure Type

The results for the regressions by expenditure type are presented in table 9, and only regressions for expenditure with Election Office is shown. Model a has the natural log of the constant expenditure in election office (other expenditure categories ore omitted) as the dependent variable. Models in row b have the log of the constant expenditure per voter in one given category, and models in row c have the log of constant expenditure per vote per seat as the dependent variable. The only coefficients shown are the ones for the adjusted $Gini$ variable. Estimated coefficients for the other control variables are omitted and all models have clustered standard errors at the prefectural level.

The main components of the total expenditure are Personnel, Election Office, Printing and Advertisement,

one could expect that one of those four categories are likely to be driving the results. Only models using expenditure on election office show a consistent positive and significant coefficient between the Adjusted Gini and the expenditure. Therefore, we say that Election Office expenditures are driving the results, as it is the category that is most correlated with the Gini coefficient once we control for other variables.

Table 9: Japanese Upper House Elections. Expenditure per Category - Fixed Effects

	(6) Election Office
(a) Exp	2.03***
	(0.74)
(b) ExpV	2.00**
	(0.74)
(c) ExpVS	1.99**
	(0.74)
Obs.	602
Year FE	Yes

Regressions per type of expenditure for the Japanese Upper House elections. Only estimated coefficients for the Gini variable and for expenditures in election office are shown. Standard errors in parentheses, *p $<$ 0.1, **p $<$ 0.05, ***p $<$ 0.01

5 Addressing Spatial Correlation in Brazil

A visual analysis of figure 1 in section 3 suggests that candidates in municipalities that are next to each other spend a similar amount of resources in political campaigns. In particular, elections seem to be more expensive (in per voter terms) in the North and Center-Western regions.

The literature has already documented spillover effects among Brazilian administrative entities. Mattos and Rocha (2008), for example, finds evidence that income inequality can affect positively the size of Brazilian states in terms of public spending. Furthermore, they find evidence that for a given state, neighboring states' public expenditures are a substitute of that state's public spending. In a study for England's local administrations, Revelli (2002) finds that neighbor's tax increases have a negative impact on incumbent's popularity, whereas own tax increases have a negative effect.

In this section we hypothesize that there might exist a spillover effect (spatial effect) in electoral costs. In particular, we take into account the possibility that candidates in municipalities surrounded by other municipalities whose candidates tend to spend more on electoral campaigns also have high campaign costs. We used the software STATA 14 and the package `xsmle`, which is capable to estimate spatial econometric models and perform model selection tests. A quick overview of spatial econometrics for panel data can be found in appendix 5.

We start our analysis of the potential spatial effects on electoral costs in Brazilian municipalities by testing for spatial auto-correlation calculating the Moran's I (Cliff & Ord, 1981). If positive and significant, it indicates that the variable of interest is positively auto-correlated in space. There is no simple way to report a single Moran's I for panel data. Beenstock and Felsenstein (2019) suggests that the values of the statistic for each cross section should be averaged and then tested. Bivand, Millo, and Piras (2021), on the other hand, argues that one could compute the Moran's I for panel data by making a pooling assumption, which is not always desirable. Here, we follow the same strategy as in dos Santos and Faria (2012) and report one Moran's I for each cross section[7].

Table 10 shows the estimated Moran's I for (private donations per voter. For all years, the Moran's I is positive and significant, indicating that municipalities with high campaign donations are surrounded by

[7]We use the *Queen* approach as the contiguity criterion.

municipalities with high campaign donations and vice-versa. It is worth noting that although it remains significant, the Moran's I is substantially smaller in 2016. This might be an indication that prohibiting campaign donations from private companies might have reduced the spatial spillover effect in campaign spending.

Table 10: Moran's I - Brazilian Municipalities

	2004	2008	2012	2016
Don/Vot	0.23***	0.03***	0.28***	0.09***

Moran's I for each cross-section. Variables are donations per voter and estimated values per voter for mayors and local representatives. *p $<$ 0.1, **p $<$ 0.05, ***p $<$ 0.01. Source: author

To address the spillover effect on campaign donations and estimated values, we estimate 4 different models using spatial econometrics. In this study, we consider three different types of spatial models: Spatial Auto-regressive (SAR), Spatial Error (SEM) and Spatial Durbin Models (SDM) model. We then test for the best specification (rows $SAR\chi^2$ and $SEM\chi^2$, whose null hypothesis is that SDM is the better fitting model) and for fixed and random effects variants.

Table 11 contains the results for the SDM models. Only estimated coefficients for the Gini index are shown and control variables are omitted. The parameter ρ, that reflects the strength of the spatial dependence, is positive and significant. Furthermore, the estimated coefficients for the Gini index are positive for the $Main$ and for the Wx matrices, meaning that a municipality's Gini and the neighboring municipality's Gini affect campaign donations and estimated values positively.

The positive estimated coefficients for the Gini index in regression 7 points towards a positive effect of income inequality on campaign donations of mayors and local representatives even when controlling for spillover effects. This effect seems to hold for neighboring municipality's and own municipality's income inequality. In a typical OLS model, the effect of changes in independent variables in the dependent variable can be interpreted as a partial derivative (i.e., the effect of a change in x_i in y is the partial derivative of y with respect to x_i. However, in an SDM model, neighboring observations also affect y, meaning that the usual interpretation is not valid. It is still possible to calculate direct, indirect (the effect of neighboring units on a specific unit) and total (the sum of direct and indirect effects) marginal effects using Monte Carlo simulations (LeSage & Pace, 2009). These effects are shown under the $Direct$, $Indirect$ and $Total$ effects Monte Carlo estimates, and are all positive and significant. This suggests that in Brazil, income inequality from a certain municipality and income inequality from its neighbors affect campaign expenditures positively.

Table 11: SDM Fixed Effects - Brazilian Municipalities

	(7)
	Don/Vot
Main	
Gini	0.26*
	(0.16)
GiniIncome	−0.00
	(0.01)
Wx	
Gini	0.75**
	(0.29)
GiniIncome	−0.03
	(0.02)
Spatial	
ρ	0.26***
	(0.01)

Continued on next page

Table 11 – *Continued from previous page*

	(7) Don/Vot
Variance	
σ_e^2	0.53***
	(0.02)
Direct	
Gini	0.31*
	(0.17)
GiniIncome	0.00
	(0.01)
Indirect	
Gini	1.05***
	(0.39)
GiniIncome	−0.04
	(0.02)
Total	
Gini	1.37***
	(0.44)
GiniIncome	−0.04
	(0.03)
$Obs.$	19968
$R^2 within$	0.05
$R^2 overall$	0.00
$R^2 between$	0.01
$SAR\chi^2$	69.92
$SEM\chi^2$	81.51
$hau\chi^2$	1144
Time FE	Yes
Individual FE	Yes

SDM models for Brazilian municipalities - Fixed Effects. The dependent variable is: Don/Vot - donations per voter. Robust standard errors in parenthesis, *p $<$ 0.1, **p $<$ 0.05, ***p $<$ 0.01. Source: author.

We also run the same regressions for Japanese prefectures, but the estimated coefficients for the Gini index are positive for the $Main$ matrix, but negative for the Wx matrix. This suggests that a prefecture's own income inequality affects campaign costs positively, but neighboring prefectures' income inequality affect it negatively. Looking at the marginal effects, the direct effect of a prefecture's income inequality on electoral costs is positive and significant as expected. However, the indirect impact - i.e., the impact of neighboring prefecture's income inequality on a specific prefecture - is negative and significant. This is the opposite of what was fount for the Brazilian case. The direct and indirect effects have similar magnitudes, meaning that the total effect is small, but non-significant. This might due to the differences in data granularity between our samples for Brazil and Japan. While in Brazil we have data at the municipal level, the sample for Japan contains observations aggregated at the prefectural level.

It is important to state that the results found here largely depend on the specification of the spatial weight matrix. In Brazil, especially in the Northern region, big municipalities are separated by large distances, meaning that a distance based spatial weight matrix might be a better approach.

6 Conclusion

The present study aims at further investigating the relationship between income inequality and electoral campaign financing by focusing in two very different countries. Japan and Brazil clearly occupy opposite

ends in terms of global inequality indices. Brazil is a fairy young democracy and is remarkably unequal, whereas Japan is a mature democracy and has low income inequality levels. The empirical approach consisted of fixed effects estimations for both Brazil and Japan.

In the Brazilian case, a 4 year panel on local elections from 2004 to 2016 containing about 20.000 observations for local assemblies showed that income inequality affects electoral costs positively: campaign donations are higher in municipalities where the Gini coefficient is higher. Furthermore, the main results also remain unchanged when spatial spillover effects are controlled for.

For Japan, the panel covering 13 elections for the House of Councillors again demonstrated the positive relation between electoral campaign costs and income inequality. Furthermore, the estimations per cost category showed that for 11 different types of expenditure, Election Office expenses were driving the results. Similarly to the Brazilian case, the result is robust to spatial spillover effects, but income inequality in neighboring prefectures have negative effects on own prefecture's campaign costs.

Although econometric evidence and formal modelling are far from being unquestionable tools for analyzing social phenomena, we believe our results not only bring new insights concerning electoral campaigns, but confirm what has been found so far by the literature. For Brazil, we use the Gini Index estimated from the RAIS database, but different approaches that take into account informal workers are important extensions. Moreover, better accessing the effects of the spillover effects on campaign expenditures and using different spatial weight matrices are a few suggestions we leave for future research.

Nonetheless our results are especially relevant for countries that are experiencing a rise in income inequality levels and for countries that have experienced persistent high income inequality, like Japan and Brazil. They also have important policy implications, the main one being that reducing inequality is a key policy in order to maintain a reliable and fair electoral system.

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