Cadê o Médico? Access to Primary Care and Voting Outcomes: Evidence from healthcare expansion in Brazil*

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Abstract

This paper investigates whether improved access to primary care physicians in Brazil resulted in electoral benefits for the incumbent government. In 2013, the Brazilian Workers Party introduced a large-scale program aimed at expanding primary health care access by employing and retaining thousands of doctors to under-served, vulnerable municipalities. Employing a difference-in-difference estimation on a matched panel, I find that in municipalities in which the program was strongly improving healthcare access, the Workers Party gained roughly 1.5 percentage points in subsequent presidential elections. The increase is driven by an expansion in the availability of doctors as opposed to new clinics or equipment.

JEL Codes: (list).

Keywords: healthcare access, public services, voting.

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1 Introduction

One of the main responsibility of governments is to provide public goods and services, intended to increase equity among the population (Batina & Ihori, 2005, p.1, p.35).

Brazil is ambitious in its aspiration to improve equity through public services: Its constitution makes the government responsible to treat access to education, housing, sanitation, and healthcare as social rights which ought to be available to all Brazilian citizen.

Especially strong attention is devoted to the importance of healthcare: the constitution acknowledges the social determinants of good health and stipulates that access to health care services ought to be equal and equitable (Castro et al., 2019; Paim et al., 2011). Consequently, the Brazilian Unified Health System (*Sistema Único de Saúde*, SUS), the largest universal healthcare system in the world, is tax funded and considered a public good. And while the SUS enjoyed strong expansion in the last years, continued large efforts and investments are required to practically achieve universality in terms of access and quality (Massuda et al., 2018).

One of these large-scale efforts is the More Doctors Program (*Programa mais Médicos* in Portuguese; PMM). The PMM's main goal is to provide vulnerable and under-served areas with primary care doctors, thereby tackling one of the biggest challenges in Brazilian healthcare (Hone et al., 2020). Although primarily a health care program, the public has always perceived it to have political elements too. More specifically. the program is intricately linked with the Brazilian Workers' Party (PT, the acronym from its Portuguese name *Partido dos Trabalhadores*), the biggest leftist party in Brazil. The PT introduced PMM in 2013, and already for the presidential elections 2014, the federal program was coined a "trump card" for the PT's re-election bid (Bergamasco, 2013). The PMM also featured heavily in the presidential debates and campaign of the elections in 2018 and 2022 (Soares, 2022). One of the most striking features of the program, was that, from 2013 until 2018, a majority of the employed doctors were foreigners, namely Cubans, which added greatly to the perception that the program was as much a (leftist) political program than it was a health care program (Redação, 2015).

This article poses the research question whether the PMM, by expanding and facilitating healthcare access and improving healthcare quality, had any electoral ramifications. For this, I am employing a canonical Difference-in-Difference event-study regression on a dataset containing 5,560 Brazilian municipalities that spans over 6 presidential elections from 2002 to 2022.

When accounting for the large socioeconomic heterogeneity of PMM municipalities, I find that the program increased the vote share of the incumbent government. On average, the ruling party increased its vote share by around 0.9 percentage points in PMM municipalities in the two presidential elections of 2014 and 2018, the ones immediately following PMM's introduction in 2013. The effect grows stronger the more salient the program's improvements were for the local availability of primary care doctors: splitting PMM municipalities in two halves depending on treatment intensity reveals that in more rural and under-served areas, the PT vote share increased by 1.1 percentage points in 2014 and 1.5 percentage points in 2018. I show that it is the increase in doctors, as opposed to health care clinics or equipment, which drives the results.

By shedding light on how and when large-scale government interventions, in this example a program aimed at improving primary health care access, can entail electoral benefits, this paper adds to our understanding

The paper extends a rich body of literature which connects public good provision to political outcomes in democracies. Retrospective voting assumes voters to be rational agents that will reward politicians for improvements made during their tenure. Both, personal and social improvements are basis for this assessment (Kramer, 1971). If public goods increases the utility of voters, politicians in turn have an incentive to provide them to their electorate. This is especially true in developing economies with high levels of income inequality and in which a high share of the population benefits strongly from the public provision of goods (Cerda & Vergara, 2008). Luo et al. (2010) provide evidence for both sides of the equation, voters and politicians, in China: mayors facing constituency elections started investing more strongly in the general provision of public goods, and voters in turn rewarded such behavior. Different papers established such a connection for distinct kinds of public goods. There is plenty of evidence suggesting that voters reward direct financial relief and benefits, especially if the underlying social program is targeted (Cerda & Vergara, 2008; Linos, 2013; Manacorda et al., 2011; Zucco & Power, 2013). Social programs targeting education (Assunção & Estevan, 2022), sanitation (Kresch et al., 2023), and healthcare (Braga, 2020) also improved sentiment towards (local) governments. However, there are some studies that could not establish any electoral effect (Imai et al., 2020). Some argue even that social programs depressed the incumbent's vote share (Blattman et al., 2016; Sandholtz, 2023). These studies stress that implementation in the respective political Economy is a crucial factor. Sandholtz (2023), for example, found that a large reform to the school system in Liberia, which improved educational quality in the country, still resulted in adverse effects for the incumbent government. This was because the teachers, an

important social and politically engaged group, opposed the reform. Imai et al. (2020) did not find evidence that either cash transfer or improved access to health care had electoral impacts. The authors explain their findings, which contradict much of the literature, with the distinction between targeted and programmatic social policies: While the former is designed to reward existing supporters or incentivize swing voters to become supporters, the latter works under a defined set of rules and voters can reasonably expect that program participation and benefits are not contingent on who is in power. While the investigated policies in Mexico were of a programmatic nature, most social programs around the world are clientelistic / programmatic hybrids. The authors argue that electoral benefits only materialize if the program engages in some form of "pork-barrel" politics. However, while Brazilian politicians have a history to engage in clientelistic government spending, the *Bolsa Famiília* program seemed to be of programmatic nature (Fried, 2012).

This paper also relates to literature on the PMM in specific, which is so far limited to the program's implementation and health care effects. While PMM is prima facie a programmatic program and municipal access is contingent on specified rules, why and how municipalities were allowed to participate or not was not always transparent (Hone et al., 2020; Oliveira et al., 2016). Nevertheless, the program successfully expanded the availability of doctors and increased primary health care utilization, especially in under-served areas. Evidence on whether this translated to improved health outcomes is more mixed (Carrillo & Feres, 2019; Fontes et al., 2018; Hone et al., 2020; Oliveira et al., 2016).

2 Context

2.1 The PT within Brazil's democracy

Brazil's modern democratic history began in 1985 with the country's present constitution stemming from 1988. It enshrined a bicameral, presidential system and emphasized the importance of social inclusion (Castro et al., 2019; de Castro et al., 2021).

On the one hand, the constitution grants strong executive and legislative powers to the president: the president has strong agenda-setting power and, with the help of presidential decree, enforcing power. On the other hand, however, certain features of the Brazilian system could impede effective government and stability: Brazil has one of the highest party fragmentation in the world, its parties are weakly institutionalized, and especially local elections are rather specific to individual candidates

rather than parties and ideology.

Political analysts and the party itself describe the PT as an exception to this rule, suggesting that it consistently and coherently adhered to a particular ideology, emphasizing social inclusion and equitable growth as tenets of its political program (Ribeiro, 2013).

Figure 1 shows that the PT was a preponderant force in Brazilian politics since it won its first presidential elections in 2002. Primarily carried by Brazil's middle class to their first victory, the party successfully expanded their voting base to the poorer strata of society in 2006, mainly due to the introduction of the large conditional cash transfer program *Bolsa Família* (Zucco & Power, 2013). After 2006, the PT's vote share gradually decreased, bottoming-out in the elections 2018, the only popular presidential vote the party lost in the last 20 years.

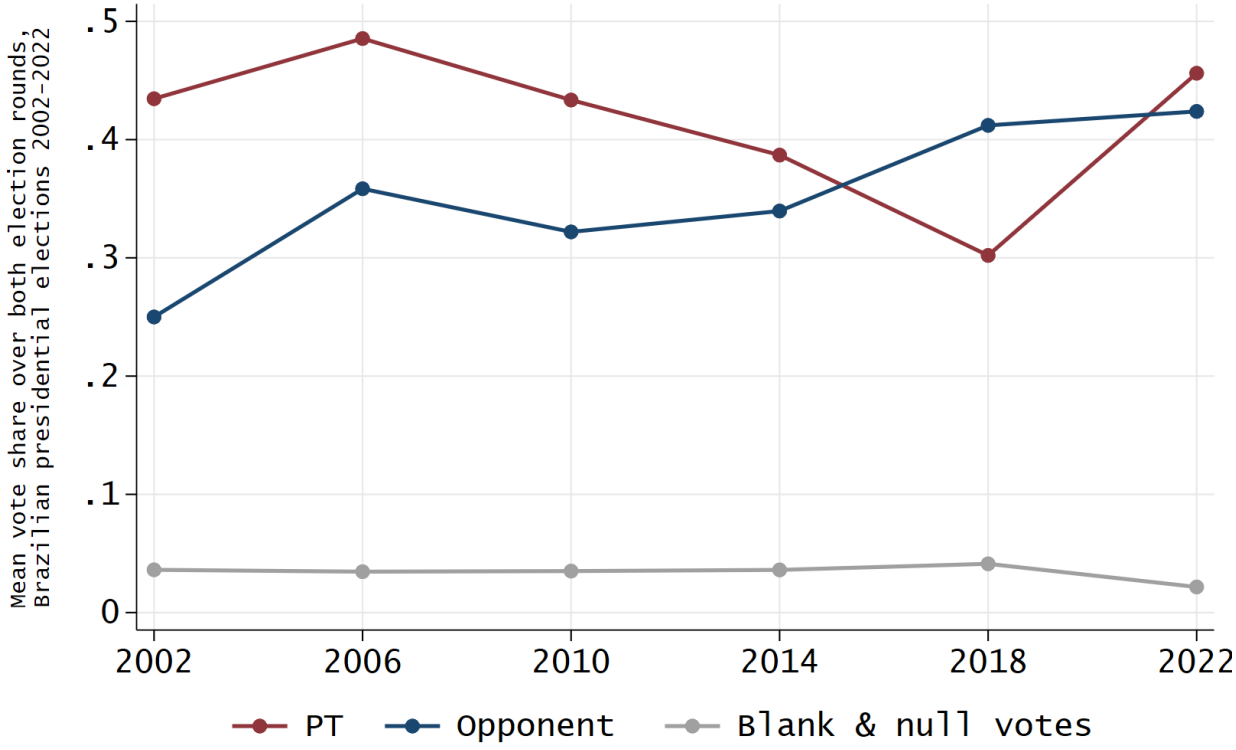

Figure 1: Mean vote share of the two main candidates over both election rounds in Brazilian presidential elections, 2002-2022.

2.2 Healthcare in Brazil

Besides its emphasis on social inclusion, the Brazilian constitution devotes particular attention to the importance of health. It treats comprehensive healthcare as a human and social right and

holds the government responsible to ensure that everybody can access health care services. In that vein, it acknowledges the social determinants of good health and stipulates that access to healthcare needs to be equal and equitable (Castro et al., 2019; Paim et al., 2011).

The product of these aspirations is the Brazilian Unified Health System (*Sistema Único de Saúde*, SUS), the largest universal healthcare system in the world. The system is tax funded and considered a public good, and Brazil indeed achieved an impressive expansion in healthcare access and outcomes. Nevertheless, health care access and quality remains unequal, and while several governments, most notably the ones led by the PT party, expanded healthcare access significantly, lots of challenges remain, for example not just attracting but retaining doctors in under-served areas. Thus, it is argued that only sustained investment and effort will be able to reduce still strongly entrenched regional and socioeconomic health disparities (Castro et al., 2019; Massuda et al., 2018; Sánchez-Ancochea & Mattei, 2011). Such investments should benefit the vast majority of Brazilians; even though more affluent Brazilian make use of privately provided health services, approximately 75% of the country's population is exclusively relying on publicly provided health care (Rocha et al., 2021).

2.3 Programa Mais Médicos

The main aim of the PMM were the provision of primary healthcare doctors to under-served and deprived areas and the continuous expansion and improvement of local healthcare supply and quality. Participation in the program was mostly conditioned on municipality characteristics (rather than on incumbent health care needs). Municipalities needed to fall into one of the following categories: having at least 20% of its population being considered extremely poor; belonging to the 100 municipalities with the lowest income per capita and having more than 80,000 population; state capitals; metropolitan regions. Additionally, there is another wide group of "other" which encompasses further areas with extreme poverty; municipalities with low or very low human development index, municipalities which are considered vulnerable (mostly semi-arid climate, Quilombo or indigenous communities). Some of these municipalities in the group, however, do not seem to fulfill these criteria and benefited due to to opaque reasons (Hone et al., 2020; Oliveira et al., 2016).

Until PMM, the main determinants of whether a municipality could offer publicly primary healthcare to its residents was the local quality of life and proximity to urban centers. Hence it is not surprising that, despite offering competitive remuneration and extensive benefits, few Brazilians

initially applied to be part of PMM; most PMM positions required the doctors to stay in poor and remote municipalities. Thus, the government opened applications to the program to doctors trained abroad. Through an international agreement, the Cuban government agreed to send thousands of Cuban doctors to fill PMM vacancies for which no other professional could be found (Oliveira et al., 2016).

In terms of health care, most analysts positively assessed the PMM. The program was successful in achieving a meaningful expansion of primary healthcare doctors. Around 18,000 doctors, working in more than 4000 municipalities, ensure healthcare access to around 20 million additional Brazilians, 15% of the total population. Overall quality of care and patient satisfaction rose (Castro et al., 2019).

In terms of politics, however PMM was controversial since its inception. Next to conservative politicians, national and regional medical associations also largely opposed the program (Silva et al., 2018)[1]. Since its introduction by the PT government of Dilma Rousseff in 2013, the PMM featured strongly in all presidential elections. It was, for example, considered the PT's trump card in Dilma's bid for re-election in 2014 (Bergamasco, 2013). The program was also subject to intense debate in the Brazilian presidential elections of 2018 and 2022, especially due to the Cuban involvement.

Also for 2018, PMM was a central point of contention between the PT and their main political opponent in these elections, Jair Bolsonaro. The latter is a strong critic of the program, especially due to the involvement of the Cuban government. The PT lost the presidential elections in 2018 to Jair Bolsonaro, a fierce critic of the PMM. His election resulted in all Cuban doctors leaving the program at the end of 2018, and in plans to gradually phase it out. The PMM's importance thus gradually waned over the coming years (Pires, 2023). Nevertheless, when the PT regained the presidency with the elections of 2022, the PMM got reinvigorated.

[1]The federal and regional councils of medicine, the most important associations of Brazilian doctors, largely opposed PMM. These associations are responsible for certifying and supervising every doctors, allowing her to work in Brazil. PMM doctors, in contrast, were under direct supervision of the government and managing institutions (most notably the Pan-american Health Organization). Hence, among the doctors' associations critiques were the alleged lack of qualification and supervision of the doctors, especially the Cuban ones. Arguably, another reason might have been the program's power to undermine the associations' control over the the supply and supervision of medical professionals in Brazil.

3 Data

3.1 Data Sources and main variables

I combine data sources on Brazilian health care, election results and socioeconomic variables on the municipality-year level from 2002 to 2022. Below I describe the main variables of my analyses and the respective sources of data.

Electoral data

My outcome variables are presidential election results, measured as share of total votes. I look at the vote share obtained by the presidential candidate of the PT coalition, either at the municipality level or the voting booth level. Presidential elections in Brazil are held every four years, with our sample covering all federal elections from 2002 to 2022. As a covariate, I also use the information on whether the municipality mayor is ideologically aligned with the current federal government or not. I source all electoral information from the Brazilian Superior Electoral Court (Tribunal Superior Eleitoral; TSE).

Health care data

The main explanatory variable is either the extensive or the intensive margin of municipal participation in the PMM. The extensive margin refers to a binary variable indicating whether a PMM municipality participated in PMM or not (values 0 or 1). The intensive margin captures the importance that PMM doctors play relative to the local pre-program primary healthcare infrastructure. I follow Fontes et al. (2018) and use the ratio of PMM doctors working in the election year and the primary care doctors which were present in 2012, the last year before the program's introduction. Based on this ratio, I split PMM municipalities into strongly and weakly treated municipalities. The data needed to construct these variables is stems from the Brazilian Ministry of Health.

Regarding information on the PMM program, through the government portal "Lei Acesso Informacao" I requested and obtained data sets containing the name, nationality, municipal workplace, and contractual start and end date of each PMM doctor. The source for all other health care data is "DATASUS", the Ministry's of Health's department tasked with collecting and disseminating information and data on health care. It provides the National Registry of Health Facilities dataset (*Cadastro Nacional de Estabelecimentos de Saúde*, CNES). CNES identifies every professional

through a unique working ID, and also provides their names, current workplace and hours worked, but does not indicate whether the professional worked as a PMM doctor or not. It also provides me with a full registry of health care facilities and equipment.

With this information I construct the explanatory variables of interest, PMM's extensive and intensive margins on the municipality level.

On this level of aggregation, I can fully exploit both datasets for all analyses. However, when attempting to explain the channels of my municipality results, I use more fine-grained data on the health care center, for which I match the CNES with the PMM data through the name and working location of the professional. This exercise yields a successful merge of roughly 81% of all PMM doctors in my sample period. Doctors that could not be merged are missing in the CNES dataset, but there is no indication of a systematic pattern in terms of their workplace, nationality, or contract details.

In later exercises, I use municipal health care equipment and facilities to check if other, concurrently happening, health care expansions other than doctor supply are important for explaining the relationship between PMM and election results.

Municipality characteristics

I use time-variant municipal socioeconomic characteristics, which might have influenced both, electoral results and the local provision of primary healthcare, as control variables. I use GDP per capita, the population density, the share of residents over the age of 60, the sex ratio, total value added (VA) produces per 100,000 residents, the public sector's share to total municipal VA, and the agricultural sector's share to control for socio-economic changes within the sample period. Information stems from the Brazilian Institute of Geography and Statistics.

4 Descriptive Statistics

Figure 8 shows the total number of primary healthcare doctors working in public primary care centers, the number of PMM doctors and Cuban PMM doctors working in Brazil from 2012 to 2022. It shows that PMM doctors constitute a meaningful fraction of all primary healthcare doctors. In the sample period, we see a steady increase in the number of primary healthcare doctors, PMM and non-PMM. The only exception is 2018 to 2019, where the Cuban exit at the end of 2018 resulted in a decline in PMM numbers, as virtually all Cuban PMM doctors ceased to work. When the COVID

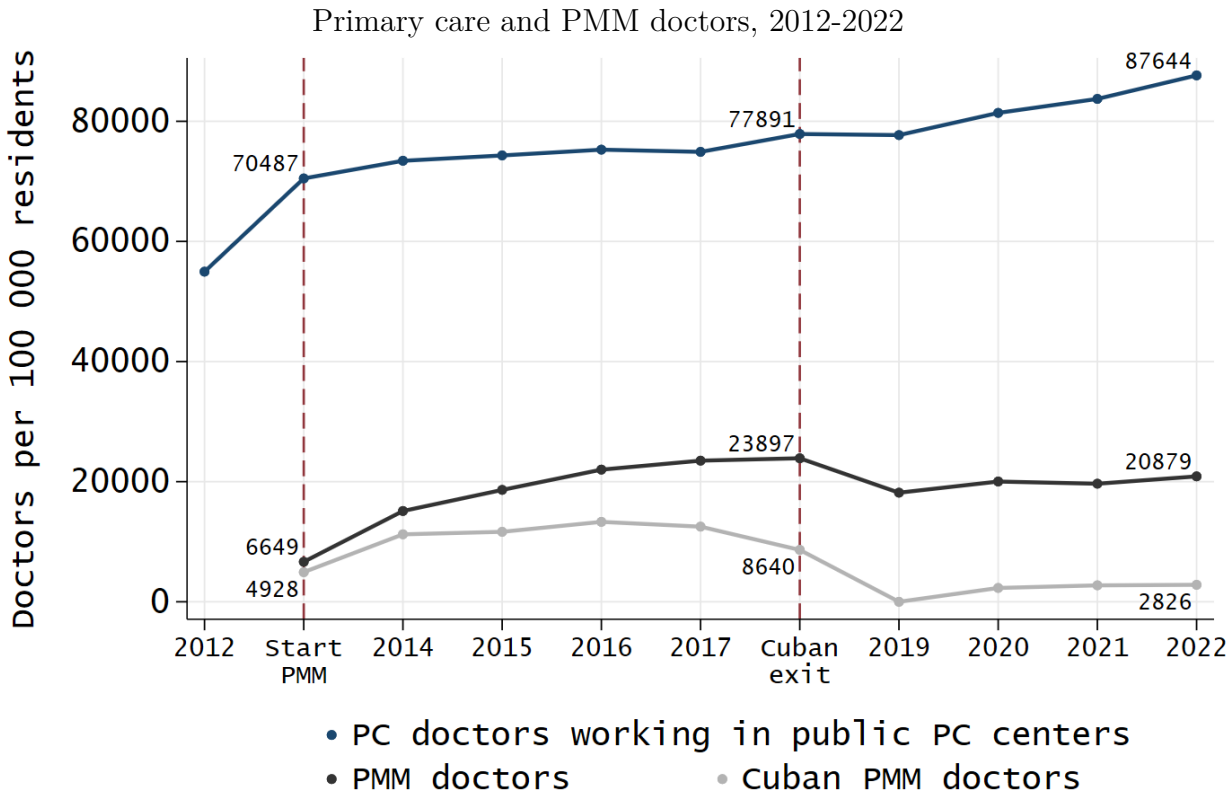

Figure 2: The graph shows the annual mean in the numbers of primary care doctor contracts (blue line), PMM doctor contracts (black line), and Cuban PMM doctor contracts (grey line) from 2012 to 2022. Original data from the Ministry of Health and CNES.

crisis hit Brazil, some Cuban doctors where invited to resume their work.

4.1 PMM participation

The municipality is the smallest administrative unit in Brazil and the level on which PMM is implemented. Table 1 shows the distribution of municipalities according to eligibility criteria for PMM set by the Ministry of Health in at the program's introduction in 2013.

Profile	min. 20% poverty	Capitals	G100	Metropolitan region	Other	N
Total	1,708	27	98	509	3,228	5,570
in PMM by 2014	1,308	27	94	368	1,882	3,679

Table 1: Categorization of municipalities by the Ministry of Health for the introduction of PMM, 2013. Categories are having at least 20% of the population living in extreme poverty, being one of the 27 federal capitals, belonging to the 100 poorest municipalities with more than 80,000 inhabitants, located in a metropolitan region, and "other".

More than half of all municipalities do not fall under well-defined criteria, and they also make

up the largest group of PMM municipalities. These "other municipalities" nominally also encompass vulnerable municipalities, e.g. located in semi-arid regions or successors of former escaped slaves settlements, and low HDI municipalities, but previous evidence indicated that many of them were in fact not in a precarious position and not in need of program participation. At the same time, some municipalities that did not participate would have fulfilled the criteria in terms of need and vulnerability, as can be be seen by the non-participation of 400 municipalities with at least 20% of extreme poverty (Oliveira et al., 2016).

Most participating municipalities joined the program early on before the first post-PMM presidential election in 2014, and subsequent rollout was gradual. Table 2 shows the number of participating municipalities from 2013 to 2022, and it also shows the strong presence of Cuban doctors in the program.

PMM Municipality	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
No	3,523	1,891	1,627	1,587	1,615	1,694	1,710	1,696	1,700	1,570
Yes, hosted Cubans	1,785	3,391	3,411	3,385	3,281	2,881	0	1,248	1,365	1,404
Yes, total	2,047	3,679	3,943	3,983	3,955	3,876	3,860	3,874	3,867	4,000
N	5,570	5,570	5,570	5,570	5,570	5,570	5,570	5,570	5,567	5,570

Table 2: Number of municipalities which hosted PMM doctors throughout the years. Original data from the Ministry of Health.

In my principal analysis, I compare the group of early PMM adopters, consisting of the 3,6779 municipalities that have joined PMM by the presidential elections in 2014, with the 1,570 municipalities that did not adopt PMM until the presidential elections in 2022. Although not always adhered to, PMM participation was conditional on socioeconomic vulnerability and health care needs. Thus, these two groups should strongly differ from each other. Table 3 shows municipal pre-PMM averages indeed differed quite strongly in certain dimensions. Municipalities that did not or could not participate in the program were, on average, smaller and less densely populated, were richer and had a more productive local economy. Furthermore, there were more people privately insured and whereas primary healthcare was able to cover an average of 91% of these municipalities' populations, in PMM municipalities the coverage rate was only 82%. All in all, PMM municipalities' HDI was lower in 2010. The two groups were similar in the share of elderly, black, mixed, and indigenous people, and experienced slightly better improvement in HDI from 2000 to 2010. Politically, pre-PMM differences were rather small, with PMM municipalites voting slightly more for the PT and having slghtly more left-leaning mayors.

	No-PMM	PMM
Population size	11617	46492
Population density	50	142
Share of elderly (60+)	.12	.11
Self-declared black, mixed, indig.	.91	.92
No. of bolsa família families (per 100k)	7551	8821
Bolsa família expenses per resident (in 2021 prices)	151	190
GDP per capita (R$ 1,000)	11033	9222
Value added, total (per 100k)	993,632	823,890
Value added, agronomy share	.25	.22
Value added, public share	.32	.33
Primary healthcare coverage (%)	90	80
Number of privately insured (per 100k)	6918	6142
HDI 2010	.68	.65
HDI change 2000 - 2010	.13	.14
PT vote share	.45	.47
Mayoral ideology (Left (1) - Right (2)	1.8	1.7

Table 3: Municipal averages from 2002-2012, before the PMM introduction in 2013. The PT vote share consist of municipality voting results in the federal elections of 2002, 2006, and 2010. Mayor's ideology is the result of mayoral elections in 2004, 2008, and 2012. Other variable averages are from 2002-2012, with the exception of the census variables HDI (2000,2010) the combined share of the community that identifies as either black, mixed, or indigenous (2010). Another exception are the variables concerning bolsa familia, for which data is only available from 2006 onward.

4.2 PMM intensity

Most previous literature investigated whether PMM *participation* mattered for health outcomes (Carrillo & Feres, 2019; Hone et al., 2020). However, some papers recognized that it is important to measure how meaningfully PMM improved the local healthcare structure, i.e. how intensely the program affected municipalities (Fontes et al., 2018; Santos et al., 2017). I reckon that the meaningfulness of the program to the local supply of doctors is key to assess whether it had electoral ramifications. This is because patients and voters are more likely to notice a difference when PMM mattered for their primary care access. I follow Fontes et al. (2018), by measuring the intensity of PMM with the ratio between municipal PMM doctors in 2014, the year of the first post-PMM election, and all municipal doctors in the year 2012, the last pre-PMM year.[2] I then split the PMM municipalities based on this intensity variable, creating a low and a high-intensity PMM treatment group. I focus on the

[2]This approach does not consider whether PMM doctors replaced ordinary doctors. For example, there could have been cases for which incumbent municipality doctors merely became PMM doctors (Hone et al., 2020). In robustness checks, I exclude the few municipalities in which the number of all primary care doctors in 2014 equals the number that had worked there in 2012. Results do not change.

Figure 3 shows the density of the distribution for the calculated intensities for all PMM municipalities in 2014. The average intensity value is around 0.6, as indicated by the dashed red line. This is slightly more than the median, which separated the low-intensity group (no shading) from the high intensity group (grey shading).

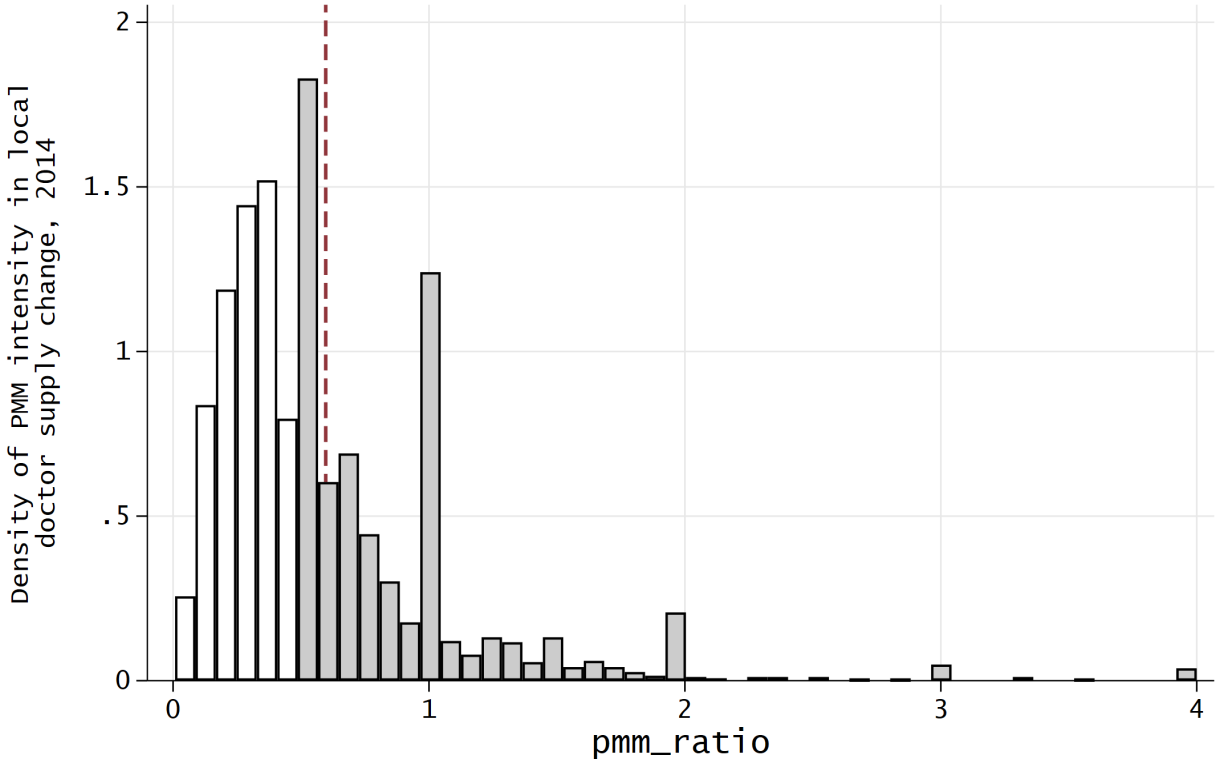

Figure 3: Density of the distribution in the ratio of PMM doctors in 2014 and all primary care doctors in 2012. The dashed vertical line represents the overall mean at roughly 0.6.

Figure 4 shows this distribution geographically. Non-PMM municipalities are in white, and PMM municipalities are in either light or dark blue, contingent on whether they are in the low or high intensity group. Grey municipalities are not part of my sample, as they have not yet adopted PMM by 2014 (but will so eventually).

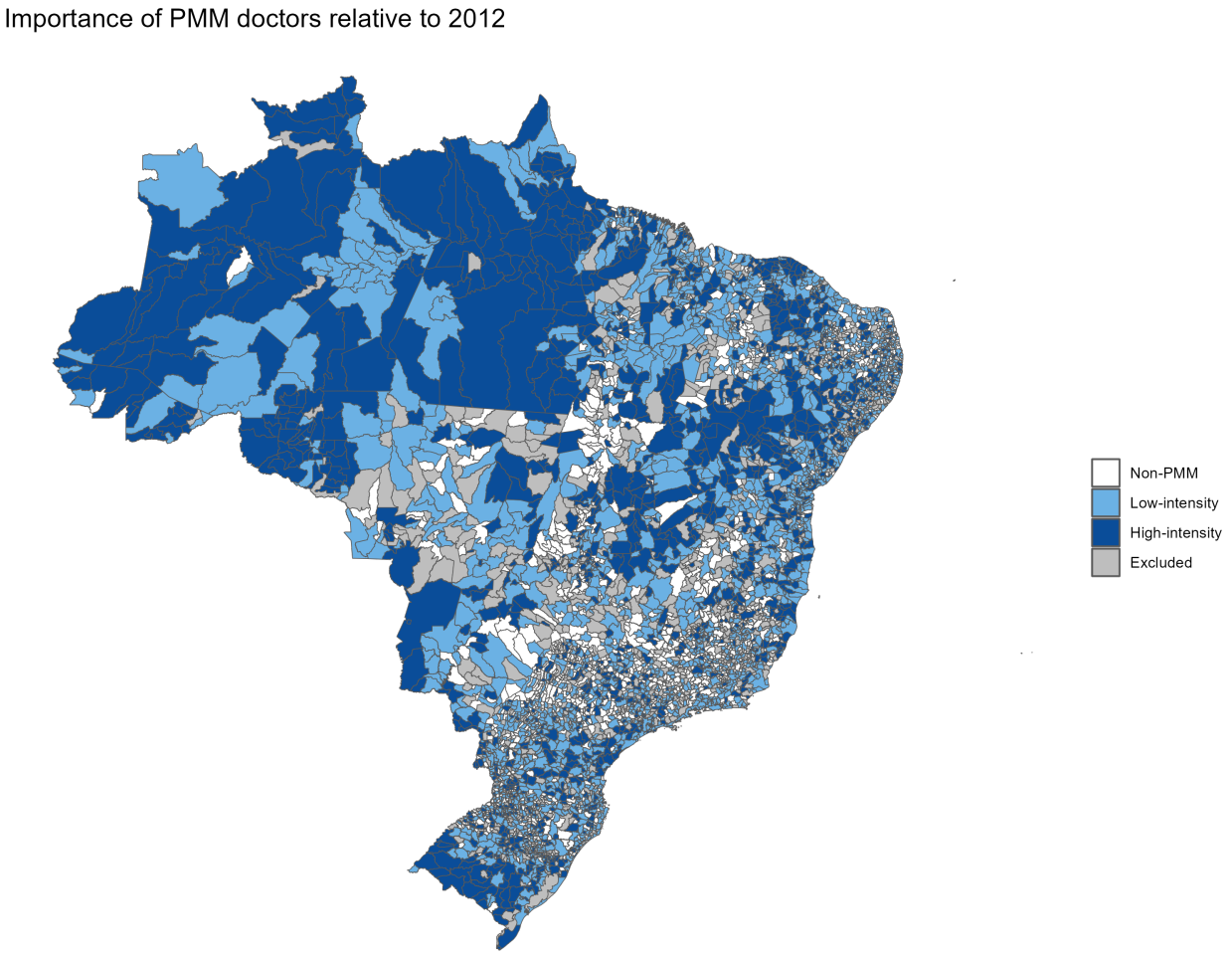

Figure 4: Map of Brazilian municipalities based on PMM intensity in 2014. Non-PMM municipalities in white, low-intensity PMM municipalities in light blue and high-intensity PMM municipalities in dark blue. Grey municipalities are not part of my sample.

5 Methods

5.1 Entropy Balancing

In order to estimate the impact of the PMM program, I create a meaningful comparison group by matching non-PMM municipalities with PMM municipalites via entropy balancing on pre-programm municipality characteristics (Hainmueller, 2012). Due to the great disparity in municipality profiles, my main concern is to increase the overlap between treated and non-treated groups in terms of socio-economic conditions and health care needs. Thus, besides matching on fixed effects such as states and PMM profile (Table 1, I match on all socioeconomic and health care variables listed in

Table. 3[3] I use the 2010 values of these variables, as Brazil held the last presidential elections before the introduction of PMM in this year, making it the reference year for the later estimations, and it is also a census year which allows me to use a plethora of municipality variables, such as the local racial composition, which are unavailable for other years. Using the reference year values for balancing is

Table 4 mirrors the municipality characteristics of Table 3 and shows that the matching process achieved to balance treatment and comparison group to a great extent. The exception is the population size, as the balancing process cannot generate sufficient overlap between the groups when including the variable. The variable remains a control variable in every equation and the matching process nevertheless approximated the group averages. Interestingly, the PT vote share between the groups is now perfectly balanced, even though the outcome variable did not form part of the matching process. This indicates that differences in the unmatched sample correlated with differences in the support for the PT.

	No-PMM	PMM
Population size	19712	46493
Population density	143	142
Share of elderly (60+)	.11	.11
Share self-declared black, mixed, indig.	.92	.92
No. of bolsa família families (per 100k)	8768	8821
Bolsa família expenses per resident (2021 prices)	191	190
GDP per capita (R$ 1,000)	9296	9222
Value added, total (per 100k)	833864	823905
Value added, agronomy share	.22	.22
Value added, public share	.33	.33
Primary healthcare coverage	89	80
Number of privately insured (per 100k)	6522	6142
HDI 2010	.65	.65
HDI change 2000 - 2010	.14	.14
PT vote share	.47	.47
Mayoral ideology (Left (1) - Right (2)	1.8	1.7

Table 4: Municipal averages in 2010, after matching early PMM adopters with never adopters through matching by entropy balancing (Hainmueller, 2012). All variables except for population size, PT vote share and mayoral ideology are part of the balancing process.

[3]The only exception is population size, as the entropy balancing process cannot generate sufficient overlap between the groups when including the variable.

5.2 Difference-in-Difference

In order to investigate whether PMM participation and expanded primary care access had some electoral effects, I use a Difference-in-Difference (DID) event-study-style regression, comparing municipal outcomes between 2002 and 2022.

I start by estimating a dynamic DiD event-study design with an absorbing, non-staggered binary treatment adoption. Thus, the treatment variable distinguishes between a "clean" comparison units which are not treated throughout the sample period, and units in the treatment group which all received treatment at the same time and stayed treated throughout the sample period. This set-up allows the use of the proved two-way fixed effects (TWFE) estimator to assess the average treatment effect on the treated (ATT) in a DID setting (Roth et al., 2023). Nevertheless, I check all my results with more recent DiD estimators (Sun & Abraham, 2021).

Restricting the sample to early- and never adopters makes the interpretation of PMM more intuitive, and it reduces the sample size only marginally: 92% of all eventual PMM municipalities joined the program by 2014 (cf. Table 2). Furthermore, diagnostic tools do not indicate that aggregation issues under staggered treatment timing and heterogeneous treatment effects are large issues for my sample. In principle, it is thus justified to use the TWFE on the whole sample (De Chaisemartin & d'Haultfoeuille, 2020).

The equation for this model for municipality i in election year t is:

$$Y_{it} = \phi_i + \gamma_t + \gamma_t^* \times \phi^{*s} + X_i\beta_i + \sum_{t=-T}^{t=-2} \beta_t(t \times D_i) + \sum_{t=0}^{t=T} \beta_t(t \times D_i) + \epsilon_{it} \tag{1}$$

Y_{it} is the outcome of interest: the vote share of the PT presidential candidate in federal elections in the first voting round. D_i represents whether a municipality participated in PMM by the elections in 2014 (=1), or whether it never participated in PMM (= 0). Treatment assignment is thus stable throughout the period of analysis. The first summation of equation 1 sums up the coefficients of pertaining to the group of PMM municipalities on the elections prior to the actual introduction of the program in 2013. The second summation summarizes all such coefficients for elections after PMM's introduction, i.e. from 2014 to 2022. Municipality fixed effects ϕ_i are meant to absorb time-invariant factors that could affect both, PMM program participation and election results. Examples are aridity or the fact that voters in Latin America frequently exhibit sticky political partisanship (Linos, 2013). Election fixed effects absorb annual trends common to all municipalities,

such as the "lava jato" corruption scandal which started in 2014 and badly damaged Brazil's political establishment. Additionally, I add flexible time trends for all 27 Brazilian states $\gamma_t^* \times \phi^{*s}$, absorbing variation that is particular to any of the 27 Brazilian states over time. Finally, I control for municipal time-variant variables X_i, namely GDP per capita, the number of families receiving bolsa familia support per 100,000 residents, the share of the elderly (aged 60 or above), total population and population density, total value added by 100,000 inhabitants, and the share of value added by the public sector and the agribusiness sector, respectively.

In a second regression model on the same sample, I will investigate how intensely a unit of observation has been treated, and whether this mattered for presidential election results. For this, I take the PMM intensity categories described in Section 4.2.

$$Y_{it} = \phi_i^* + \gamma_t^* \times \phi^{*s} + \sum_{t=-T}^{t=-2} \beta_t^*(t \times G_i) + \sum_{t=0}^{t=T} \beta_t^*(t \times G_i) + \epsilon_{it}^* \tag{2}$$

where I switch the binary treatment D_i for the categorical treatment G_i which puts municipalities with a high ratio of PMM to pre-PMM primary care doctors into treatment group 2, and those with a low ratio intro treatment group 1.

These TWFE equations face two challenges: Firstly, they cannot exploit the entire sample: some municipalities have not joined PMM by the elections in 2014 but only later, see table **??**, and are therefore excluded. Secondly, PMM participation and intensity might exert heterogeneous treatment effects over different elections. For example, the program's political salience might be high for the elections following its introduction, but might have decreased with the years as voters get used to improved healthcare access. In other words, the two challenges for the commonly employed TWFE estimator in this setting are the staggered rollout of treatment and the program's potential heterogenous treatment effects. Both could introduce bias as the standard common trends assumption requires treatment effects to be constant across groups and time to ensure the validity of the estimator (Sun & Abraham, 2021).

Nevertheless, I argue the threats for equation 1 and 2 are limited. My sample excludes late-adopters of PMM, which the sample size only marginally: Comparison and treatment groups cover more than 82% of all Brazilian municipalities, confer Table 2. Furthermore, diagnostic tools do not indicate that aggregation issues under staggered treatment timing is a large issue for my sample, negative weights are minimal. In principle, it is thus justified to use the TWFE even on the whole sample (De Chaisemartin & d'Haultfoeuille, 2020). Nevertheless, I check the obtained TWFE results

with the more recent estimators. Specifically, I use the estimator defined by Sun & Abraham (Sun & Abraham, 2021) (SA), which allows for a staggered adoption of the treatment and heterogeneous treatment effects by cohort. As other recently proposed estimators, the SA estimator estimates cohort-specific treatment effects, defining the cohorts relative to the time of treatment adoptions and aggregating their weight on the estimated ATT relative to their cohort size. For example, the impact of PMM on the first elections after its local introduction is composed of the cohort of municipalities that adopted PMM by 2014 (87% of all treated units), the cohort that adopted PMM by 2018 (8%), and the cohort that adopted PMM only by 2022 (5%), confer Table 8. Its interpretations thus differs from the period-specific ATT estimated by the TWFE estimator.

Limitations of the SA estimator include that it does not allow that treated units cease to be treated. I hence drop a small number of municipalities that, at one point, stopped hosting PMM doctors altogether. Also, the estimator is designed for investigating treatments defined as binary. To investigate whether the intensity of PMM mattered for election results, I split PMM municipalities into two quantiles, Instead of having a categorical treatment variable, I compare the two quantiles separately with the control group when applying the Sun % Abraham estimator.

6 Results

6.1 Municipality results

6.1.1 Extensive margin: Municipal PMM participation

Figure 5 shows the coefficient estimations for the impact of PMM participation on the municipality level when employing the TWFE estimator, comparing PMM municipalities that adopted the program before the first election in 2014 with municipalities that did not adopt PMM during the sample period.

The upper plot shows results for the unweighted municipality sample, the lower plot shows results when matching municipalities with weights obtained from socioeconomic and demographic variables.

Not weighting the sample results in no significant effects on the 5% level, with the exception of a positive pre-trend in 2006. When we match the treatment to the control group, however, pre-trends for treatment and comparison groups do not deviate, but there is a moderate, and

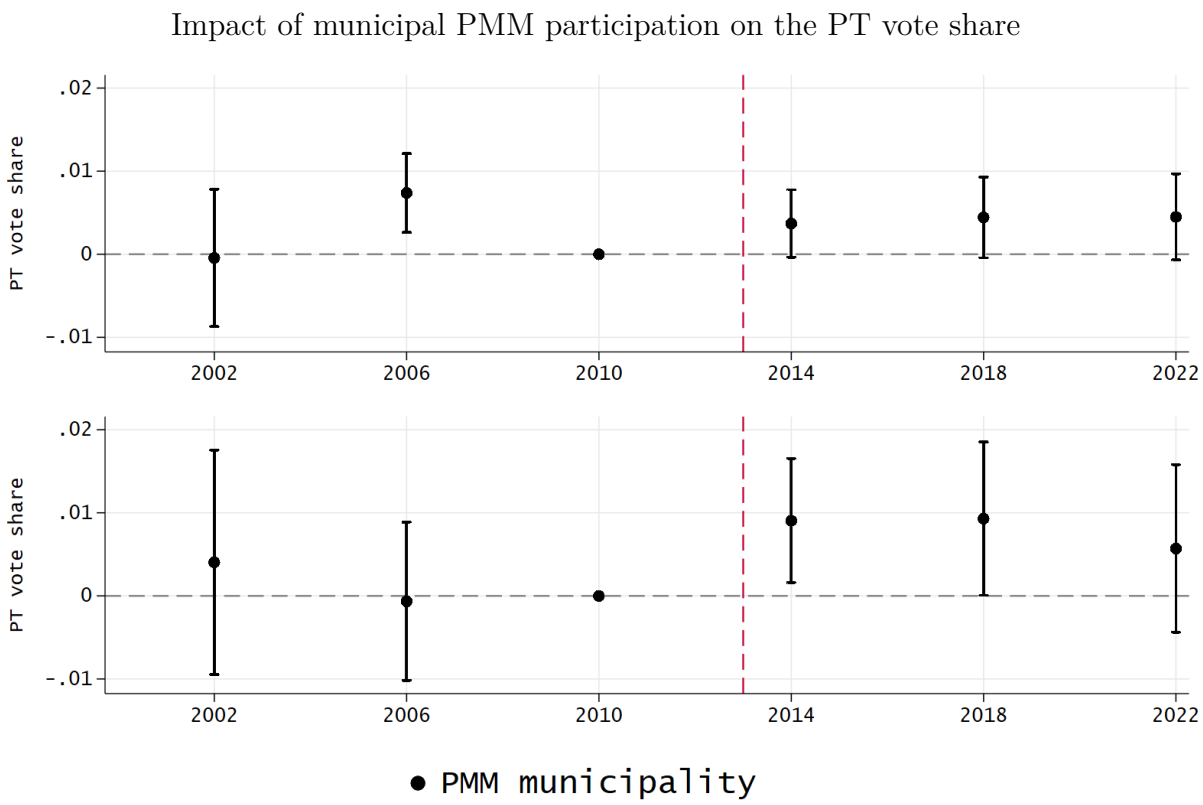

Figure 5: The graph shows estimated point estimates of the coefficients of the marginal effect of PMM participation on the vote share of the PT candidate in Brazilian elections, 2002-2022. Trends for the treated group, here municipalities that participated in PMM, are compared to non-PMM municipalities. Whiskers around the point estimates present the 95 percent confidence intervals, where standard errors are clustered at the municipality level. Data from TSE and the Ministry of Health/Datasus.

statistically significant, effect for the two elections following the program's introduction. There a a 0.09 percentage points impact for the elections in 2014, the first election following the PMM introduction in 2013 and the bid for re-election of the then president Dilma Rousseff, and an equally sized impact for the elections in 2018.

See Appendix Tables 5 for details on the estimated coefficients.

6.1.2 Intensive margin: Municipal PMM doctors

Figure 6 shows coefficient estimates for the two PMM intensity groups described in Section 4.2. As before, the Figure's upper plot shows results on the unweighted sample while the lower plot shows results when applying matching weights.

Regressions on the unweighted sample are not reliable due to the incomparability between treatment and control groups. Nevertheless, it shows lower and higher intensity municipalities

followed a markedly different trajectory in terms of PT voting. In terms of access to PMM, it is possible that the low intensity group enjoyed some form of pork-barrel politics, while municipalities in the high intensity group were favored in order to increase government support.

However, these dynamics disappear when assessing the weighted sample. Regression results there show that municipalities in the lower intensity half of PMM municipalities increased their PT vote share on average by 0.74 percentage points in 2014. All other point estimates are not statistically significant on the 5% level. The high intensity group increased its vote share on average by 1.1 percentage points in 2014, and 1.5 percentage points in 2018. See Appendix table 6 for the precise values of the relevant point estimates and standard errors.

Impact of municipal PMM participation on the PT vote share

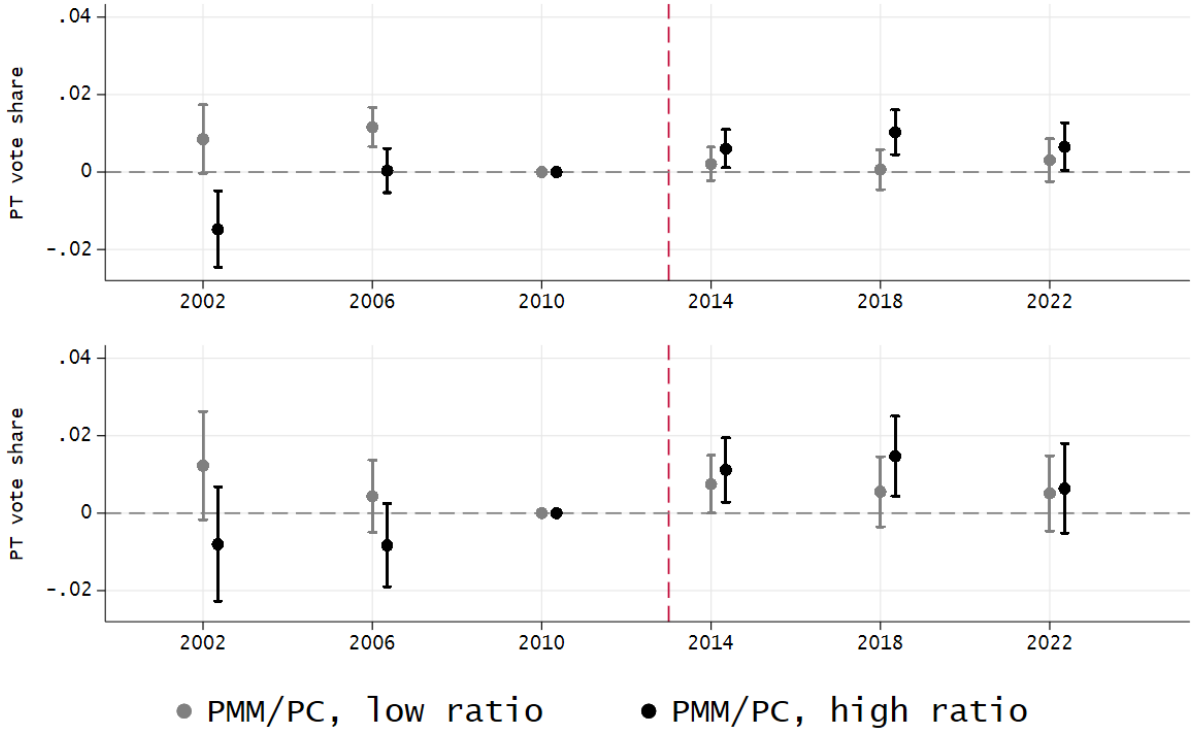

Figure 6: The graph shows point estimates for low-intensity (grey) and high-intensity PMM involvement on the vote share of the PT candidate in Brazilian elections, 2002-2022. Trends for PMM treatment groups are compared to non-PMM municipalities, showing the "level effect" of PMM adoption (Callaway et al., 2024). Whiskers around the point estimates present 95 percent confidence intervals, where standard errors are clustered at the municipality level. Data from TSE and the Ministry of Health/Datasus.

7 Channels

In this section, I will explore various heterogeneous effects that could help me in explaining the observed variations in the relationship between doctor supply expansion and local voting patterns. I will focus on the election results in 2014 because on the one hand the 2014 coefficients are consistently significant throughout differently defined equations in Section 6, and on the other hand, purely from a public policy perspective, I makes sense that PMM mattered for the elections in 2014: these presidential elections were held just one year after the introduction of the PMM by the then President, Dilma Rousseff, who made the program a centerpiece of her campgaign for re-election.

I consider three different channels to explain the positive impact of the PMM on the PT vote share in 2014. The first one is the direct public goods channel, that is that voters appreciate the improvement of public goods and services. The more a municipality benefited from PMM, the higher should be the reward for the implementing government. I distinguish municipalities based on the potential outcomes of program implementation, such as increases in primary care utilization and improved health outcomes.

Zucco (2013) found that bolsa família improved the PT vote share especially among the poorest in poor municipalities. PMM and bolsa família can be seen as complementary and target the same populations (Sánchez-Ancochea & Mattei, 2011). As a second consideration thus scrutinizes heterogeneity in municipal development. While my main regression results in Section 6 rely on a sample matched on socioeconomic factors, I now disentangle my sample based on socioeconomic and demographic characteristics. I will also make use of survey data from datafolha, to scrutinize who voted for the PT and where they live. Finally, I explore heterogeneity in primary care doctors. Patients might react differently to the PMM based on their doctor's characteristics, and doctors themselves could act as political actors that influence the voting behavior of their patients (Sandholtz, 2023).

7.1 Improved public goods channel

Several existing studies established a relation between improved public goods and services and political or voting behavior: Chinese villagers rewarded the incumbent mayor for implementing and improving local public goods (Luo et al., 2010). In Norway and Liberia, incumbent national governments benefited from implementing educational reforms that expanded and improved school

access (Acemoglu et al., 2021; Sandholtz, 2023). In Brazil, citizen are more likely to pay their taxes and see the government favourably if they have access to sanitation (Kresch et al., 2023). There is also some evidence that local mayors benefited from the construction of new primary care centers in Brazil (Braga, 2020; Camargo, 2021).

Health care utilization and health outcomes

To be added.

Doctor quality

To be added.

Expansion in health care facilities and equipment

To be added.

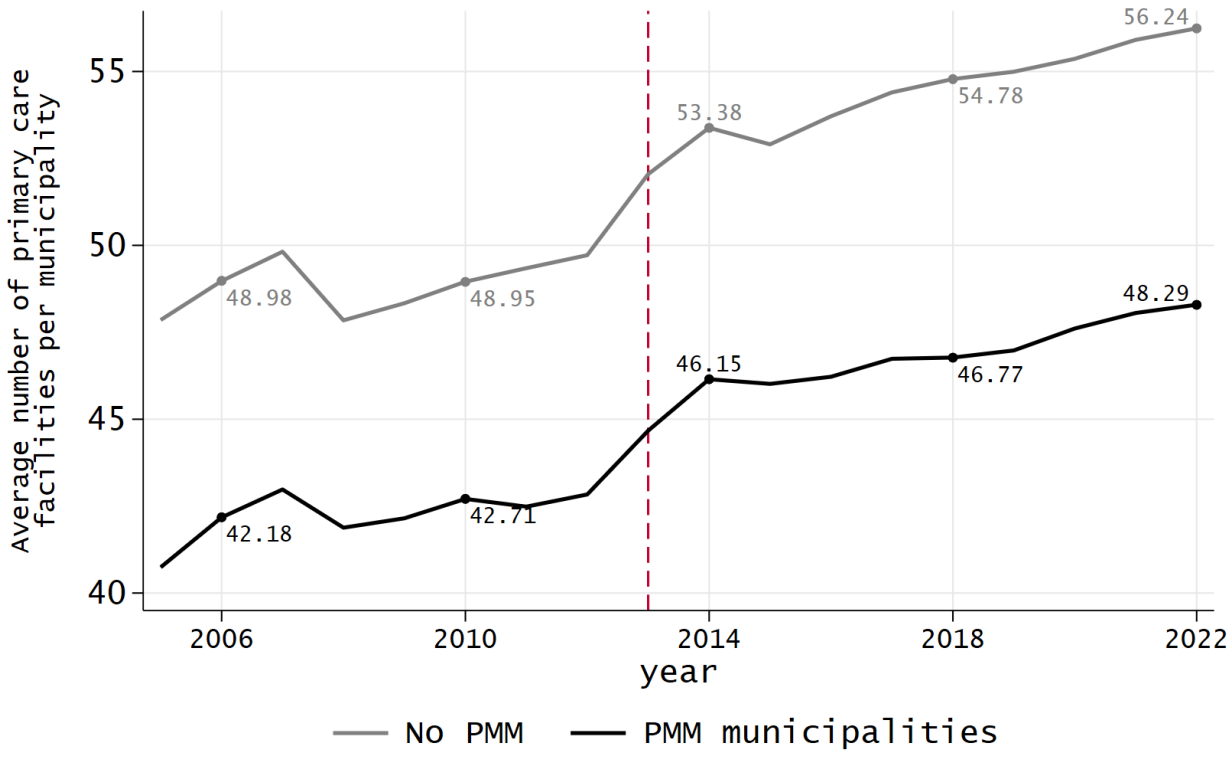

Figure 7: Public primary care facilities per 100,000 inhabitants

7.1.1 Doctors as political actors

A second potential channel could be that doctors are political actors and are able to influence their clientele. Sandholtz (2023) showed that an educational reform in Liberia on average resulted

in a net-loss of voting shares for the incumbent government party, because dissatisfied teachers influenced the local constituents. As explained in section 2, the Brazilian medical organizations opposed PMM. PMM doctors, however, were satisfied with their employment (Benevides et al., 2019), and Cuban doctors especially so (Comes et al., 2016; Rech et al., 2018). If doctors are able to exert some political influence on their patients, PMM and non-PMM doctors might thus have contrasting effects on the PT vote share.

To be added.

8 Conclusion

Political analysts assess that the Brazilian Workers Party strongly benefited from the conditional cash transfer program *Bolsa Família*, which supposedly made Lula da Silva the then most popular president in the world (Zucco & Power, 2013).

This paper investigates whether Lula's successor, Dilma Roussef, reaped similar electoral benefits from her instigated large-scale government program, the *Programa Mais Médicos*. The PMM brought over 14,000 doctors to under-served areas by 2014, and the program was described as the "trump card" for the re-election campaign of the government for the presidential elections in the same year (Bergamasco, 2013; Pires, 2023). I find that PMM had moderate, but significant effects for the presidential elections in 2014 and 2018 which saw PMM municipalities increasing their PT vote share on average by 0.8 percentage points. In municipalities in which the program strongly expanded the availability of doctors the gained vote share increased to 1.1 percentage points in 2014 and 1.5 percentage points in 2018.

The results suggest that while improving primary care access helped the PT in retaining some voters' favor, it is far from being as consequential as *Bolsa Família* which increased the likelihood of voting for the PT by roughly 50% among Brazil's .

The PT's social interventions were ultimately not enough for staying in power. Mired in corruption scandals and gripped by an anti-establishment sentiment, the party lost the presidential elections in 2018, their first defeat since 2002. The newly installed government then radically changed the PMM, and the program's local presence ceased to matter for the presidential vote in 2022.

Large-scale government programs often aim to improve alleviate distributional concerns and are dependent on long-term political support. In order to maximize the benefits and insulate such

programs from political opposition, their implementation should be transparent and objective. However, if refraining from "pork-barrel" policy-making does not yield electoral benefits, it is disincentivizing for any political force (Imai et al., 2020; Mullin & Hansen, 2023). Future research is needed on how to maximize the social benefits of social programs while keeping in mind political deliberations and viability.

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A Appendix

A.1 Data & Descriptive Statistics

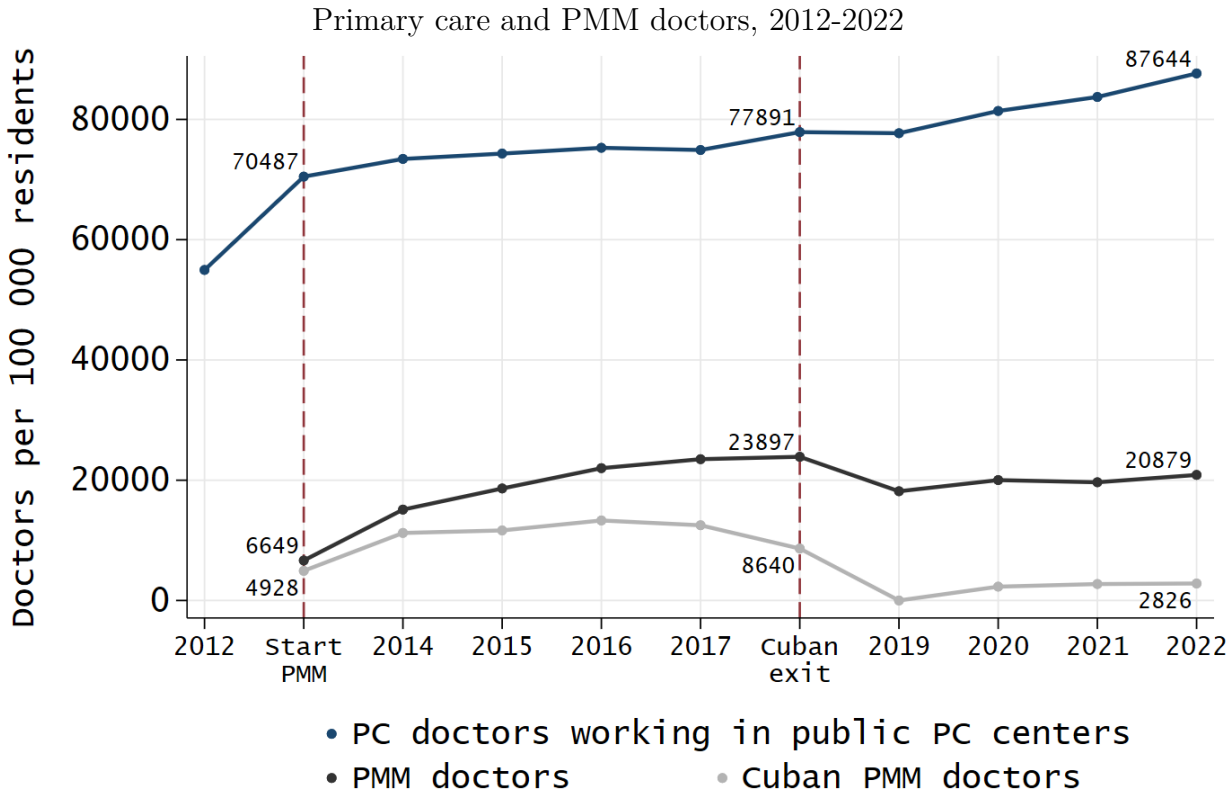

Figure 8: The graph shows the annual mean in the numbers of primary care doctor contracts (blue line), PMM doctor contracts (black line), and Cuban PMM doctor contracts (grey line) from 2012 to 2022. Original data from the Ministry of Health and CNES.

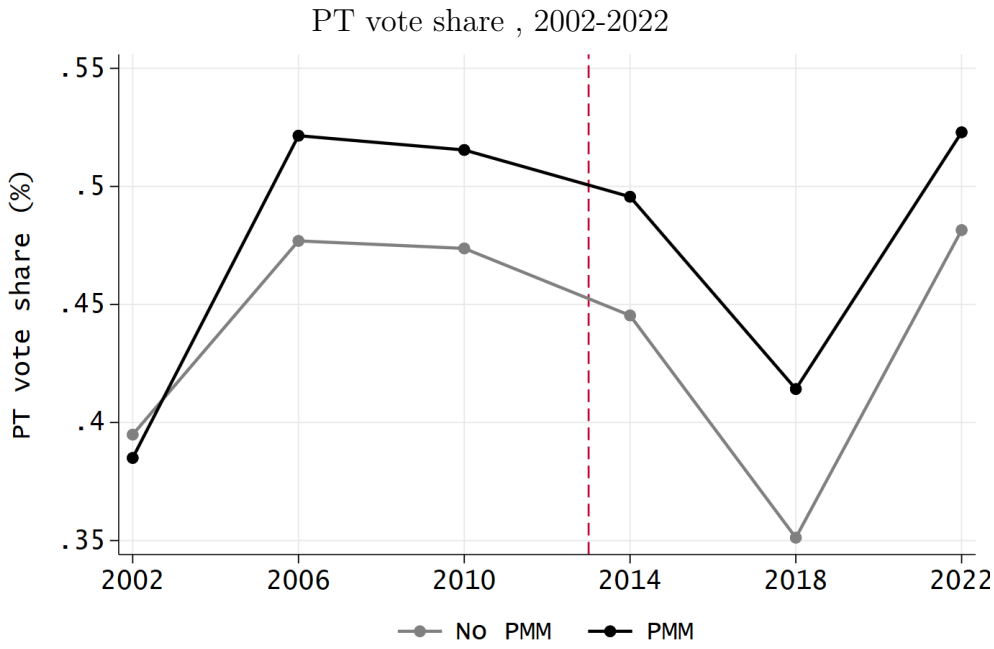

Figure 9: The graph shows the aggregated average vote share received by the PT presidential candidate in non-PMM and PMM municipalities in Brazilian federal elections from 2002 - 2022. Original data from the TSE.

A.2 Results

A.2.1 Municipality results

TWFE estimation

	(1)	(2)
PMM participation - 2002	-0.000	0.004
	(0.004)	(0.007)
PMM participation - 2006	0.007***	-0.001
	(0.002)	(0.005)
PMM participation - 2010	0.000	0.000
	(.)	(.)
PMM participation - 2014	0.004*	0.009**
	(0.002)	(0.004)
PMM participation - 2018	0.004*	0.009**
	(0.002)	(0.005)
PMM participation - 2022	0.004*	0.006
	(0.003)	(0.005)
$adj.R^2$	0.852	0.866
N	26355	26355

Table 5: Event study coefficients estimated with a TWFE estimator, depicting the marginal impact that participating in PMM had on the PT vote share in presidential elections in Brazil, from 2002 to 2022. Column (1) shows results for the unweighted sample, column (2) shows results for the sample matched and weighted on municipal socioeconomic and demographic characteristics. The dashed line divides elections before and after the PMM introduction, i.e. placebo from treatment periods. All coefficients are relative to the base election year 2010, the last presidential election before the PMM introduction. All regressions include municipality fixed effects, election fixed effects, municipality profile fixed effects, and dynamic linear time trends for every state. All regressions also include a number of time-varying socioeconomic characteristics on the municipality level, namely GDP per capita, total value added (VA) in R$ per 100,000 inhabitants, the share of VA produced by the agribusiness sector, the VA share by the public sector, the share of the population equal or older than 60, the sex ratio, population density, total population and the number of households receiving social welfare through the "Bolsa Familia" program per 100,000 inhabitants. Standard errors in parentheses. * p<0.05, ** p<0.05, *** p<0.01

	(1)	(2)
T1 - 2002	0.009*	0.013*
	(0.005)	(0.007)
T1 - 2006	0.011***	0.005
	(0.003)	(0.005)
T1 - 2010	0.000	0.000
	(.)	(.)
T1 - 2014	0.002	0.008**
	(0.002)	(0.004)
T1 - 2018	0.001	0.006
	(0.003)	(0.005)
T1 - 2022	0.003	0.005
	(0.003)	(0.005)
T2 - 2002	-0.015***	-0.007
	(0.005)	(0.008)
T2 - 2006	-0.000	-0.008
	(0.003)	(0.005)
T2 - 2010	0.000	0.000
	(.)	(.)
T2 - 2014	0.006**	0.011***
	(0.003)	(0.004)
T2 - 2018	0.010***	0.015***
	(0.003)	(0.005)
T2 - 2022	0.006**	0.007
	(0.003)	(0.006)
$adj.R^2$	0.852	0.865
N	26305	26305

Table 6: Event study coefficients estimated with a TWFE estimator, depicting the marginal impact of the level effect of low or high municipal PMM intensity on the PT vote share in presidential elections in Brazil, from 2002 to 2022. In treatment group 1 (T1), PMM intensity is relatively lower than in T2. Column (1) shows results for the unweighted sample, column (2) shows results for the sample matched and weighted on municipal socioeconomic and demographic characteristics. The dashed line divides elections before and after the PMM introduction, i.e. placebo from treatment periods. All coefficients are relative to the base election year 2010, the last presidential election before the PMM introduction. All regressions include municipality fixed effects, election fixed effects, municipality profile fixed effects, and dynamic linear time trends for every state. All regressions also include a number of time-varying socioeconomic characteristics on the municipality level, namely GDP per capita, total value added (VA) in R$ per 100,000 inhabitants, the share of VA produced by the agribusiness sector, the VA share by the public sector, the share of the population equal or older than 60, the sex ratio, population density, total population and the number of households receiving social welfare through the "Bolsa Familia" program per 100,000 inhabitants. Standard errors in parentheses. * p<0.05, ** p<0.05, *** p<0.01

Sun & Abraham estimator

Figure 10 shows the coefficient estimations obtained with the estimator of Sun & Abraham (Sun & Abraham, 2021). Using their estimator allows me to use the whole sample, thus also the municipalities that adopted PMM after the elections in 2014. This estimator focuses on the the effect relative to the time of PMM introduction; T=1 shows the impact of PMM in all municipalities in the first election after the program's introduction in all three groups. In other words, the estimator estimates cohort-specific treatment effects for each *relative* time. In praxis, the coefficient in $T = 1$ is strongly driven by the group that has adopted PMM by the elections in 2014, as it makes up 87% of all PMM municipalities in our sample. However, the estimator also considers the 8% of PMM municipalities that had adopted PMM by the election year 2018 only, and the 5 % which only had joined by 2022. The results of the SA estimator are qualitatively comparable to the ones from the TWFE estimator. There is again a statistically significant 0.007 percentage points increase in the vote share of the PT party following the municipal introduction of PMM. The average is again masking heterogeneity within the PMM group; while the PMM effect was insignificant for the lower intensity group, it is roughly 0.009 percentage points in the higher intensity group. Given that in presidential elections, a vote increase for one candidate implies a vote loss for its opponent, the magnitude of the effect makes up the difference of the two candidates in the presidential elections in 2022, in which the PT candidate Lula da Silva beat his opponent Jair Bolsonaro only by 1.8 percentage points in the second election round.

	$T = -2$	$T = -1$	$T = 1$	$T2$	$T = 3$
Adopted by 2014	-.00451691	-.00361602	.00747188	.00330725	.00206329
Adopted by 2018	-.0012127	-.00702607	-.00245632	-.00355073	0
Adopted by 2022	.02188277	.01839067	.01197952	0	0

Table 7: Cohort-specific treatment effect estimates for each relative time.

	$T = -2$	$T = -1$	$T = 1$	$T2$	$T = 3$
Adopted by 2014	.86967751	.86915679	.86967751	.90873533	1
Adopted by 2018	.08134222	.08166724	.08134222	.09126467	0
Adopted by 2022	.04898026	.04917597	.04898026	0	0

Table 8: Cohort-specific weights for each relative time.

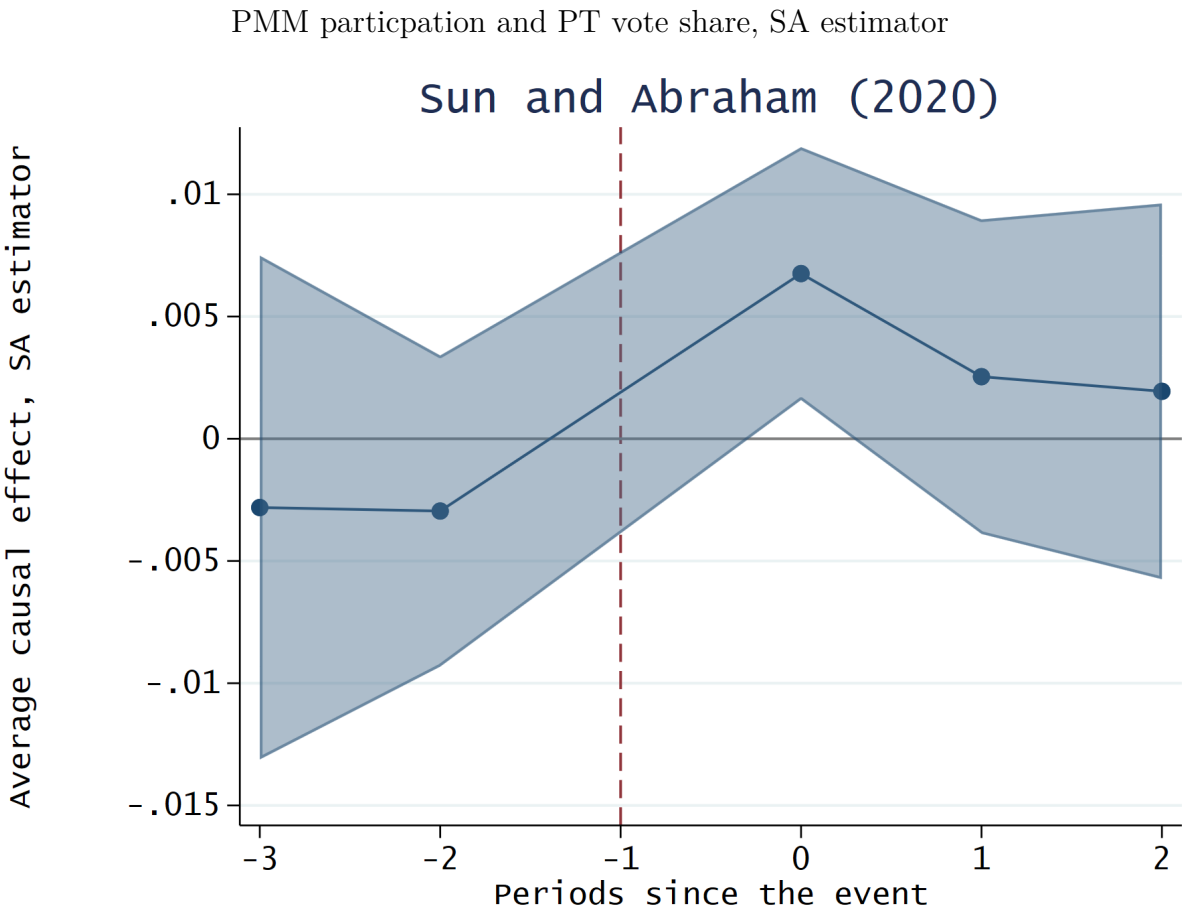

Figure 10: Coefficient estimates for cohort-specific effects of PMM participation on PT vote share in presidential elections in Brazil.