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Voters' response to in-kind transfers: Quasi-experimental evidence from prescription drug cost-sharing in Brazil

M. Christian Lehmann *, Hellen Matarazzo

University of Brasilia, Department of Economics, Brazil

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ABSTRACT

In metropolitan areas the Brazilian government provides drugs against hypertension and diabetes for free, and against other diseases 90 percent below market price. A city's eligibility for these in-kind transfers changes exogenously at given city population thresholds. We compare vote shares of mayors around these thresholds. Regression discontinuity estimates suggest that the program increases incumbent mayors' vote shares between 11 and 17 percentage points. This is larger than the electoral return of cash transfer programs reported by the existing literature, lending support to theories that in-kind transfers get more voter support despite being less cost-effective.

1. Introduction

Several papers estimate the effect of *total government spending* (or aggregate spending categories, e.g., "welfare", "defense", etc.) on incumbent votes, with mixed findings (some find positive, others negative, and again others no effect).[1] These ambiguous results suggest that voters reward (or punish) *specific policies* rather than aggregate spending. But very little is known about which specific policies are rewarded/punished how much by voters.[2] Causal inference is challenging because governments usually implement a whole bundle of policies at the same time (making it difficult to isolate the impact of each) or implement a policy at national-scale (making it difficult to find a credible counterfactual).

In this letter, we provide the first quasi-experimental estimates of the electoral rewards of prescription drug cost-sharing. In 2005, the Brazilian federal government created the *Farmácia Popular* program.[3] Initially, it consisted of government-run drug stores, commonly known under the name *Farmácia Popular do Brasil* (henceforth *FPB*), with the federal government procuring drugs and city governments providing the physical space and staff for the stores. In 2006, the federal government also started subsidizing prices in private-sector drug stores (commonly known under the name *Aqui tem Farmácia Popular*). 95% of drugs disbursed through *Farmácia Popular* are against hypertension and diabetes (Americo and Rocha, 2017). 25% and 8% of adults in Brazil are diagnosed with the first and second disease, respectively, i.e., every third voter.[4] *FPB* stores provide drugs against these two diseases free of charge, and drugs against other diseases[5] roughly 90% below market price.

Our identification strategy relies on a rule which states that only cities with 70,000 or more inhabitants are eligible for the program.[6] According to the federal government, the program's

* Correspondence to: University of Brasilia, Department of Economics, Campus Universitário Darcy Ribeiro, Brasília, DF, 70910-900, Brazil.
E-mail address: clehmann@unb.br (M.C. Lehmann).

1 For Brazil, see Sakurai and Menezes-Filho (2008) and Firpo et al. (2015). For the US, Israel, Portugal, Argentina, Colombia, and Russia, see Peltzman (1992), Levitt and Snyder (1997), Brender (2003), Veiga and Veiga (2007), Jones et al. (2012), Drazen and Eslava (2010), and Akhmedov and Zhuravskaya (2004), respectively. For cross-country analysis, see Alesina et al. (1998) and Brender and Drazen (2008).

2 Manacorda et al. (2011), Zucco (2013), De La O (2013), and Galiani et al. (2019) study the electoral return of cash transfers; Stokes (2005) of food aid; Pop-Eleches et al. (2012) of computers; Curto-Grau (2017) of public employment; Bechtel and Hainmueller (2011) of relief funds to flood victims; Bruhn (1996) and Beath et al. (2016) of community development projects; Casaburi and Troiano (2016) of anti tax evasion programs; Ferraz and Finan (2008) of local government audits.

3 A detailed description of *Farmácia Popular* can be found in the program's official program manual, available from the Brazilian Ministry of Health at http://portalarquivos.saude.gov.br/images/pdf/2014/abril/23/manual-basico-fp1170511.pdf (last accessed 23 of August 2018).

4 For sources see our online appendix.

5 Asthma, dyslipidemia, glaucoma, urinary incontinence, influenza, osteoporosis, Parkinson and rhinitis.

6 The exception are cities in the State of São Paulo, where the eligibility threshold was set to 100,000 inhabitants.

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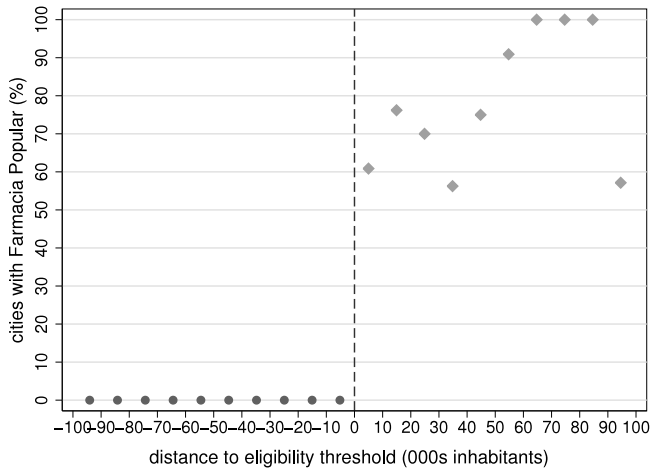

Fig. 1. Compliance. *Notes*: Each data point shows the percentage of cities with *FPB* (for population bins of 10,000 inhabitants) during the 2004–2008 legislative term.

objective is to combat diseases in metropolitan areas, and the threshold was set arbitrarily to exclude smaller cities. We use the threshold to estimate a regression discontinuity design (RDD), comparing voting behavior in cities with population slightly above and below the threshold.

Our RDD estimates suggest that *FPB* increases incumbent mayor vote shares between 11 and 17 percentage points.

2. Data, model specification and results

Fuzzy regression discontinuity design. The probability of having *FPB* stores increases sharply at the threshold (Fig. 1).[7] About 30% of mayors in eligible cities decided not to open *FPB* stores (henceforth non-compliers), which are mostly mayors from a different party as the president, suggesting that several non-aligned mayors feared that the program would increase voters' support for opposition candidates from the presidential party.[8] Therefore, in order to identify the causal effect of *FPB* on vote shares of complier mayors, we estimate a fuzzy regression discontinuity design, where the threshold serves as instrument for participation in the program. The second and first stage regressions are

$$\text{VoteShare}^{08}_{c,s} = \text{const.} + \beta\,\widehat{\text{FPB}}_{c,s} + f(\widetilde{\text{pop}}^{04}_{c,s}) + u_{c,s}$$
$$\text{if } -h < \widetilde{\text{pop}}^{04}_{c,s} < h$$
$$\text{FPB}_{c,s} = \text{const.} + \alpha\,1(\widetilde{\text{pop}}^{04}_{c,s} \geq 0) + f(\widetilde{\text{pop}}^{04}_{c,s}) + \epsilon_{c,s}$$
$$\text{if } -h < \widetilde{\text{pop}}^{04}_{c,s} < h$$

where $\text{VoteShare}^{08}_{c,s}$ is the vote share obtained by the incumbent mayor (2004–08 legislative term) of city c in State s in the 2008 city government elections. The variable $\widetilde{\text{pop}}^{04}_{c,s}$ is the 2004 population of a city (centered at the threshold). The variable $\text{FPB}_{c,s}$ indicates whether city c has any *FPB* store by the 2008 city government elections. The term $f(\widetilde{\text{pop}}^{04}_{c,s})$ is a polynomial function.

There is currently no universally agreed-upon method for selecting the optimal bandwidth h. The two most commonly used bandwidths are the MSE-optimal bandwidths of Ludwig and Miller (2007) and Imbens and Kalyanaraman (2011), respectively (henceforth LM and IK). As an alternative, Calonico et al. (2014) propose a coverage error rate optimal bandwidth (henceforth CCT). In order to rule out that our results are driven by a particular bandwidth selection method, we present fuzzy RD estimates for each of the these three bandwidths. Our parameter of interest is β, which measures the effect of *FPB* on incumbent mayors' vote shares in complier cities.

In our online appendix we corroborate the internal validity of our RD design by showing (i.) that cities around the threshold have the same socio-economic characteristics when the program launched; (ii.) that there is no sharp increase in the number of cities just above the threshold (suggesting that mayors did not manipulate/overstate their population figures in order to qualify for the program); and (iii.) that there is no difference in mayor alignment with the president around the threshold (suggesting that the federal government did not choose it opportunistically to benefit aligned mayors), and (iv.) that other policies that use population cutoffs (e.g., federal block grants as in Brollo et al., 2013 and Litschig and Morrison, 2013) are unlikely to drive our results.

Results. Fig. 2 shows the mean of mayor vote shares for population bins of 1000 inhabitants, and local linear regressions of mayor vote share on city population. In the 2008 city government elections (right graph) we see a sharp increase in mayor vote shares of about 10 percentage points at the threshold, from roughly 45 to 55 percentage points (and keeping in mind that the graph includes non-complier mayors, hence the program's effect on complier mayors is larger than the graph suggests).

As falsification (placebo) test, the left graph shows the 2004 city government elections, which were held one year before *FPB* launched. Reassuringly, we see no difference in mayor vote shares at the threshold in that case.

Table 1 presents our fuzzy RD estimates. According to the 2SLS estimates in Panel C, *FPB* increases an incumbent mayor's vote share by 18.1 and 17.6 percentage points when using the LM and IK bandwidths, both statistically significant at 1%. The point estimate for the CCT bandwidth is 17.1 percentage points but imprecisely measured, presumably due to the small number of observations (only 61 cities) in this bandwidth. The first-stage F statistic for the three bandwidths are 78, 51, and 17, respectively, i.e., it is highly unlikely that our results are driven by a weak instrument.[9]

All regressions in Table 1 use a linear spline polynomial. A quadratic spline polynomial yields 2SLS point estimates of 11.5(*) with LM, 11.6(*) with IK, and 36.7(**) with CCT bandwidths (stars indicating significance levels). Lee and Lemieux (2010) and Gelman and Imbens (2018) recommend against the use of higher order (e.g., cubic) polynomials.

3. Discussion and concluding remarks

Disease prevalence and *FPB* user statistics, as well as existing evidence on the program's effects, suggest that our results are plausible. 95% of drugs disbursed by *Farmácia Popular* are against hypertension and diabetes (Americo and Rocha, 2017). 25% and 8% of adults in Brazil are diagnosed with the first and second

[7] Data on the number of *FPB* drug stores is publicly available from the Brazilian Ministry of Health at http://datasus.saude.gov.br. Data on mayor vote shares is publicly available from the Superior Electoral Court (Tribunal Superior Eleitoral) at http://www.tse.jus.br/.

[8] I.e., when we regress non-compliance on a set of mayor and city characteristics, the only statistically significant predictor is a mayor's alignment with the presidential party.

[9] We find no effect of *FPB* on presidential vote shares. Presidential elections were held in 2002 and 2006, both won by the left-wing candidate Luiz Inácio da Silva (Lula). Using president Lula's vote share in a given city as the dependent variable, we obtain 2SLS estimates statistically indistinguishable from zero, presumably because *Farmácia Popular* was still in its infancy by the time of Lula's campaigning and presidential election in 2006 (*Farmácia Popular* launched in 2005).

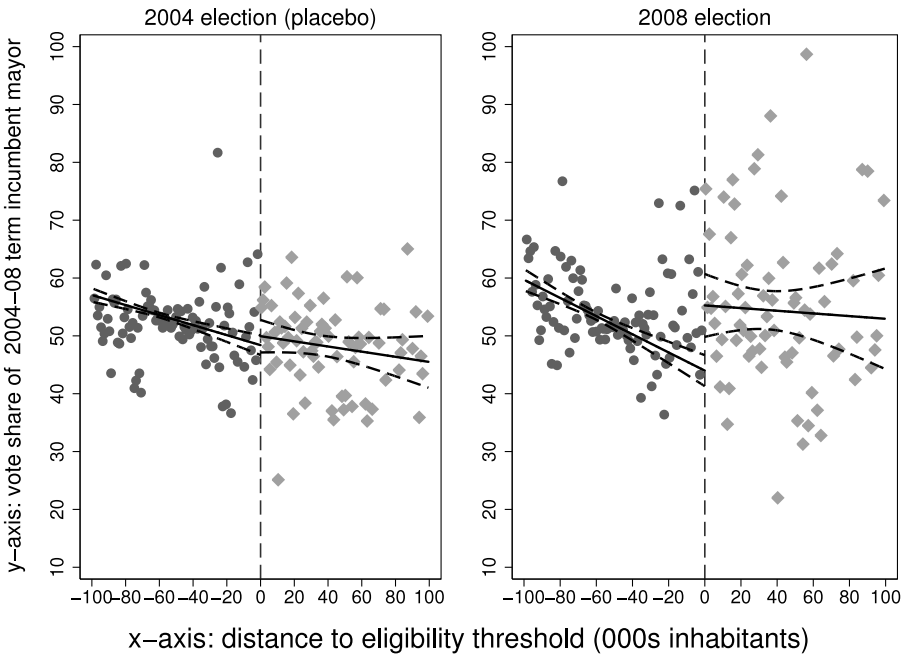

Fig. 2. *FPB* and incumbent mayor vote shares. *Notes:* Graphs show vote shares (mean for population bins of 1000 inhabitants) obtained by incumbent mayors (2004–08 legislative term) in the 2004 and 2008 city government election, respectively. Straight lines are local linear regressions, and dashed lines are the corresponding 95% confidence intervals. *FPB* launched in 2005.

Table 1
FPB and mayor vote shares.

Dep. var. in panels A,B,C:	Vote share of 2004–2008 term incumbent mayor (%)					
Election	2004 (placebo)	2008	2004 (placebo)	2008	2004 (placebo)	2008
Panel A. OLS estimates						
$FPB_{c,s}$	0.3	7.0**	1.1	5.7*	−5.0*	−6.9
	[2.56]	[3.10]	[2.63]	[3.20]	[2.40]	[6.83]
Panel B. Reduced-form estimates (sharp regression discontinuity design)						
$\widetilde{pop}^{04}_{c,s} \geq 0$	1.7	11.7***	3.9	10.4***	0.5	8.1
	[3.82]	[3.26]	[3.82]	[3.19]	[5.86]	[6.10]
Panel C. 2SLS estimates (fuzzy regression discontinuity design)						
$\widehat{FPB}_{c,s}$	2.6	18.1***	6.6	17.6***	1.1	17.1
	[5.74]	[5.48]	[6.31]	[6.02]	[11.65]	[11.19]
First-stage estimates			Dep. var.: $FPB_{c,s}$			
$\widetilde{pop}^{04}_{c,s} \geq 0$	0.65***		0.59***		0.47***	
	[0.07]		[0.08]		[0.11]	
Kleibergen–Paap F-statistic	77.5		50.7		17.1	
Bandwidth method	LM		IK		CCT	
Bandwidth h	99,000		87,000		16,000	
Observations (cities)	2,856		2,660		62	
Sample mean of dep. var.:	53.37	53.45	53.32	52.98	49.99	55.05

Notes: Square brackets contain robust standard errors, clustered at the State level.
*Statistically significant at 10%.
**Statistically significant at 5%.
***Statistically significant at 1%.

disease, respectively, i.e., every third voter.[10] Accordingly, *FPB* stores register large number of users, e.g., the mayor of Campo Grande (800,000 inhabitants) inaugurated two *FPB* stores in 2006, which in the following three years would register 408,000 clients and disburse 2.2 million drugs; the *FPB* store in Erechim (population 105,000) registered 38,000 clients in the first four years, and similar client figures are reported for the *FPB* store in the city of Barbacena (population 107,000); the *FPB* store in Vitória (population 200,000) registers over 20,000 clients per year.[11]

Large is not only the number of *FPB* users but also their utility gains. Drugs against hypertension and diabetes are provided free of charge, and other drugs 90% below market price. Da Motta et al. (2015) estimate that these savings alone generate utility gains of at least 5% for users in the first four quintiles of the income distribution, and of about 3.5% in the fifths quintile. They also acknowledge that the total utility gains are likely substantially larger if one would add utility gains from better health

[10] Prevalence increases with age: e.g., In Brazil, 59% of people aged 65 or older are diagnosed with hypertension, compared to 3.8% aged between 18 and 24 and 8,8% aged between 25 and 34 (source: see online appendix).

[11] For sources see our online appendix.

(e.g., Americo and Rocha (2017) find significant reductions in mortality and hospitalization due to the program).

Even healthy voters may derive utility from *FPB* due to insurance motives (i.e., chance of future sickness), dynastic or altruistic preferences (e.g., a kin is sick; or they value that the mayor assists sick people), because the program increases the service quality (capacity) in public hospitals by reducing hospitalizations (Americo and Rocha, 2017) and/or is perceived as a good investment (e.g., Americo and Rocha (2017) estimate that fewer hospitalizations in public hospitals save the government more than what it spends on the program), or because voters reward the mayor for bringing *pork* to their city.[12]

Furthermore, mayors would undertake substantial credit-claiming efforts, e.g., inaugurate *FPB* stores, publicly celebrate their anniversary, and inform voters of the city government's crucial role in bringing *FPB* stores to the city and keep them running (for it is the mayor who must both formally request enrollment from the federal government and provide the physical space and staff of a store). Moreover, the entrance of each store shows, clearly visible, the logo of the city government. We provide examples of mayors' credit-claiming efforts in our online appendix.

Hence, *FPB* arguably generates sufficiently large utility gains, for a sufficiently large number of voters, to plausibly compel an additional 11% to 17% of them to vote for the mayor, retrospectively as a reward (reciprocity) for the utility generated by the program (Finan and Schechter, 2012; Lawson and Greene, 2014; Manacorda et al., 2011; Sobel, 2005), and/or prospectively to encourage its continuation. In our online appendix, we illustrate more formally that our empirical results are not at odds with workhorse models of voting behavior.

Interestingly, our estimates are larger compared to cash transfer policies that pay similar benefits and reach a similar number of voters: e.g., experimental evidence from the famous Mexican cash transfer program *Progresa/Oportunidades* suggests electoral rewards of 11 percentage points (De La O, 2013). The comparison to cash transfers is intriguing: why did the Brazilian government opt for in-kind transfers instead of equivalent cash transfers to sick citizens? Recently, there has been a revival of research on cash vs. in-kind transfers — in particular empirical (i.e., experimental) — which by and large concludes that cash transfers are more cost-effective (i.e., their administrative cost are lower, and they give recipients more flexibility hence utility), corroborating earlier theories that cash transfers pareto-dominate in-kind transfers.[13]

Yet there is a dearth of evidence on the political economy of cash vs. in-kind transfers, in particular of empirical tests of existing theories that in-kind transfers get more support from tax payers because they preserve work incentives (Meltzer and Richard, 1985; Gahvari, 1994; Epple and Romano, 1996; Gouveia, 1997), improve targeting (Nichols and Zeckhauser, 1982; Blackorby and Donaldson, 1988), and/or satisfy their paternalistic preferences (Pollak, 1988). This may explain why our estimates are larger compared to cash transfer policies and, more generally, why the majority of government programs worldwide are in-kind (Currie and Gahvari, 2008) and, despite the protests of many Economists (e.g., Glaeser, 2012; Blattman, 2014), perhaps continue like that in the future.

[12] E.g., Firpo et al. (2015) find that Brazilian voters reward politicians who bring pork home.

[13] Examples of recent papers are Cunha (2014), Hidrobo et al. (2014), Aker et al. (2016), Haushofer and Shapiro (2016), Blattman et al. (2016), Aker (2017), Hoddinott et al. (2018), and Cunha et al. (2019). Theoretical arguments that cash transfers pareto-dominate in-kind transfers originate in Friedman (1962) and Hylland and Zeckhauser (1979).

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