Income and Public Service Demands: Comparative Voter Efficacy in Brazil[1]

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Abstract

Many models of public service distribution in democracies predict the poor will have high voting leverage over distributive policy due to a numerical advantage in universal suffrage political competition. Empirical studies do not bear this prediction out, especially in highly unequal democracies, where canonical models predict the poor will have the greatest leverage. This paper proposes an argument that explains the apparently low weight placed by politicians on the preferences of the poor with respect to public service policy in unequal democracies. I show that even when accountability mechanisms function properly in democracy, the poor may find themselves at an electoral disadvantage. This occurs when the poor's (likely higher) public service demands are divided more symmetrically across competing services. When the better-off pile the weight of their votes on fewer services, their votes are more responsive to a unit shift in spending, even if their total service demands are lower. This leads the spending priorities of vote-maximizing, tactically-spending politicians to more closely reflect the preferences of the more concentrated demands of the better-off than of those with higher total state dependence for services. I illustrate the argument and its implications using a study of local public health service allocation in Brazil in the context of a shock to the public primary care service dependency-level of a subset of poor voters induced by a federal transfer program. I contrast voter demands for services with vote responsiveness to service spending using original survey data I collected in Brazil in the two weeks prior the 2012 municipal elections. This research updates our understanding of accountability in unequal democracies, suggesting that the poor do not necessarily fail to hold democratic politicians accountable as many theories would suggest; rather, democratic politicians may have the incentive to prioritize the preference-ranking of the less state-dependent over those more dependent on the public services in question if the less-dependent also have less diffuse service preferences.

Keywords: Public Services - Preference Aggregation - Inequality - Accountability

1 Introduction

When do the poor have the voting power to assert their public service preferences in unequal democracies? Meltzer and Richard famously predict that democratic societies in which a majority of the voting population is made up of the poor will see considerable pro-poor redistribution, especially when the society's income distribution is highly skewed. This follows directly from the median voter theorem—when the voter with the median income is poor and the voter with the mean income is wealthier, the median voter will demand more redistribution. Meltzer and Richard's model is elegant and compelling, but also a poor predictor of redistribution in unequal democracies (Nattrass and Seekings, 2001; Przeworski, 2007; Iversen and Soskice, 2009). Why are Meltzer and Richard's predictions so wrong in politically functional but unequal democracies? Efforts to explain the deviations from the canonical theory often focus on one of two arguments (Harms and Zink, 2003). The first is the argument that under certain circumstances the poor do not prefer redistribution (Benebou and Ok, 2000). The second is that the poor, while perhaps preferring redistribution cannot always hold democratic governments accountable (Stokes, 2005; Nichter, 2008; Taylor-Robinson, 2010; Luna, 2014; Keefer and Khemani, 2003). This paper offers another explanation for constrained accountability with implications for political representation and development goals in unequal democracies.

The process of preference aggregation via individual vote in democracies leads those who depend on the state for various public services—typically the poor—to have less voting influence over service spending decisions than do voters who depend on the state for fewer services. This is true even when the institutions of electoral accountability function properly and voters vote their interests. This occurs because the service allocation calculus of tactically-spending, vote-maximizing politicians is sensitive to the responsiveness of a group's vote to strategic spending, and not to group demand for that spending. Though we often assume that the two are proportional, I will demonstrate that this is not necessarily true once considering the diffusion of group preferences over various service categories. In

fact, a multiplicity of service demands is what leads to lower response rates to service allocation decisions. This results in a situation in which spending priorities of (vote-maximizing, tactically-spending) politicians more closely reflect the ordering of the more concentrated preferences of the better-off than the preferences of those with higher total demand for public services.

I illustrate this logic with a formal decision-theoretic model and provide empirical evidence that the model applies to the case of Brazilian public health services. The model shows that preferences concentrated on fewer services (which I will call "asymmetric preferences") lead to greater responsiveness to service spending. In the empirical portion of this paper, I use original survey data from one state in Brazil to show the votes of the better-off do respond more strongly to shifts in public health service spending, despite having lower total demand for these services than the poor.

Poor and better-off voters are different on various unobservable dimensions, however. Ideally, to test my argument about relative state-dependence on different services, one would like to observe some source of controlled shift in poor voters' dependence-level on a given service, while holding the needs of other similar voters constant. I proxy for this shift in state dependence on specific public health services using the assignment of poor voters to the Brazilian federal government's *Bolsa Família* (Family Stipend) Program (hereafter, the BFP). Evidence suggests that the program improves the baseline health of recipients through improved nutrition and increases privately-procured consumption of basic medications previously provided through primary care (Ministério de Desenvolvimento Social, 2008; Medici, 2011). The BFP, thus, induces a change in the poor recipients' dependence on public health services. This treatment is imperfectly assigned across poor voters in Brazil owing largely to the infrequency with which income records are updated for this population, which is characterized by highly volatile income (Soares, Ribas and Osório, 2010), creating an observable source of variation in dependence on public health services among the poor. Exploiting this quasi-randomly assigned income shock to poor voters, I show that the decreasing dependence

of program recipients on public primary care services (which serves to concentrate recipients' preferences on hospital care) leads to higher vote responsiveness to health service spending for the recipient group, compared to poor non-recipients.

I proceed as follows. The next section briefly reviews some of the relevant literature on the voting influence of the poor in democracies and provides some useful details about health care provision in Brazil. I then present the argument as a general model illustrating that voters with greater dependence on the state for the provision of basic public services effectively "weigh" less in policy terms than voters with fewer public needs, owing to the greater diffusion of preferences across services for the more dependent group. The next section outlines the empirical approach. I then describe the survey data and provide results on both public health service demands and vote responsiveness of various groups in Brazilian society. I end with a discussion of the implications of the results, including a brief analysis of the trajectory of public health spending after the implementation of the income shock to poor voters.

2 The Leverage of the Poor in Democracies

2.1 Voting Influence of the Poor in Democracies

The canonical model of redistribution in the ideal-type democracy is grounded on the observation that, given universal suffrage, the voter with the median income tends to be poorer than the voter with the mean income. Assuming that the poor prefer more income, this implies the poor ought to vote for and benefit from redistributive spending in democracies (Meltzer and Richard, 1981). Even when suffrage is universal, however, the predictive capacity of the Meltzer and Richard model is poor, especially with respect to the effect of a country's inequality (Harms and Zink, 2003).

Other authors have made similar claims about the propensity of democracy to promote pro-poor redistribution due to the mechanism of electoral competition (Lake and Baum,

2001; Besley and Burgess, 2001; Min, 2008). It is relevant to note, however, that much of the empirical work on this topic is based on evidence that democracies spend a lot on public services. This work assumes that these public services are non-excludable and, in particular, that they reach the poor. Given this assumption, the fact that democracies spend a lot of money on services suggests that democracy favors pro-poor access to services. However, empirical research has not demonstrated that such services in fact reach the poor. Other researchers caution that observations of high public service spending in democracies do not necessarily coincide with increased benefits for the poor. Ross finds that while democracies do seem to provide more services, these services do not, on average, improve the overall welfare of the poor. He infers that the benefits of many of these public services may accrue primarily to the middle class (Ross, 2006). Indeed, many public services are inaccessible to certain users based on either *de jure* or *de facto* criteria.

2.2 Coalitions and Vote Buying

An alternative approach for analyzing distributional dynamics, which deviates from these ideal-type predictions focuses on a core-swing dichotomy. The "core voter" model suggests that parties acting strategically will spend resources on goods and services for a loyal group of voters, where possible, to maintain a stable majority coalition over time (Cox and McCubbins, 1986). The qualifier, "where possible," is what distinguishes the Brazilian case, which provides the empirical setting for the tests of my argument, from more institutionalized party settings. Brazil has too few core voters to satisfy this criterion.[1] It is common for Brazilians to vote a "split ticket," in which they opt for one party for president and another party for governor (and possibly another party for senator) in the same election. Though the tendency has decreased some since the 1990s, it is not unusual for Brazilian politicians to switch parties (Mainwaring, 1999). The fact that mayors in Brazil are more likely to lose a re-election bid than to win (Titiunik, 2011), implies they often fail to solidify a substantial

[1]There is, however, some recent evidence that partisan identification is relevant for a subset of Brazilian voters (Samuels and Zucco, 2014).

core during their first terms in office.

In the absence of a viable core voter distribution strategy, politicians must rely on an alternative spending mechanism. Dixit and Londregan use the term tactical spending to refer to expedient, targeted spending distributed to responsive groups with the aim of gaining votes (Dixit and Londregan, 1996). This differs from the core voter strategy in that the targeted groups may change from election to election. They may also lack any clear ideological affinity with the incumbent to motivate loyalty. Responsiveness to spending and the politician's ability to determine relative response rates are the key determinants of this distribution strategy.

Typically this term is used to describe discretionary spending that entails the threat of discontinuation. For some authors, the ability to monitor voters to make sure they do not renege on a deal to exchange votes for benefits is critical (Stokes, 2005). However, many cases of distribution without a clear objective threat of monitoring have been documented as producing reliable electoral returns for incumbents (Zucco, 2008, 2013; Manacorda, Miguel and Vigorito, 2011; Díaz-Cayeros, Estévez and Magaloni, 2012; de la O, 2013). The mechanism for this is not clear. Some have suggested that "norms of reciprocity" are responsible for high voter response rates to unmonitored spending (Finan and Schechter, 2012). Others focus on whether voters *perceive* themselves to be monitored (Penfold-Becerra, 2007). Still others assume that voters will be responsive to any spending consistent with their preferences, monitoring aside (Persson and Tabellini, 2005; Zucco, 2013). This paper uses this last approach as a simplifying assumption.

2.3 Institutional Mediation of Preference Expression

What determines which voters are targeted for policy- and goods-distribution in the absence of stable core coalitions? What governs the way different individuals' demands are prioritized relative to each other in policy-making? A large body of research related to institutional mediators establishes several compelling arguments for sources of variation in voter efficacy.

Analyses of these distributional dynamics often focus on the way political institutions mediate preference expression in democracies. This often takes the form of analyzing politician incentives to respond to different voter demands. For these purposes, voters are often partitioned into the organized (or interest groups) and the unorganized (Denzau and Munger, 1986; Bawn and Thies, 2003),[2] the coordinated and the uncoordinated (Cox, 1997), consumers and producers (Rogowski and Kayser, 2002), or by geographically significant regions (Ames, 1995). Others consider variation across party systems and electoral rules (Carey and Shugart, 1995; Iversen and Soskice, 2006). Empirical work has also suggested that the shape of the distribution of preferences among voters can impact the validity of the median voter theorem's predictions. Gerber and Lewis show, for example, that elected politicians are less constrained by the median in circumstances in which voters are highly heterogeneous (Gerber and Lewis, 2004).

This chapter adds one more explanation to this discussion, pointing to differences in voter responsiveness to spending that I argue are common in unequal democracies and are influential in the context of tactical electoral spending. To address the question of why poor voters often seem to have weak policy influence even when they make up a substantial portion of the voting population, I examine the mechanism of voting in the context of economic inequality, competitive elections and weak political parties. In this context, politicians have incentives to provide the basket of goods that produces the strongest electoral response. Therefore, factors that govern the mapping from individual preferences onto electoral responsiveness are key determinants in the policy leverage of different voters. I define a voter's *policy leverage* (or voting influence) as the degree to which service spending by elected politicians reflects her preferences over competing services.

[2]See Gilens and Page for a review of the literature on interest groups pertaining specifically to American politics, which is much more extensive than the treatment of interest groups in comparative politics (Gilens and Page, 2014).

3 Decentralized Public Health Services in Brazil

I use municipal-level public health service allocations in the context of shifting health care needs in Brazil to empirically evaluate some implications of my argument about vote responsiveness in unequal democracies. This section outlines some relevant details about the national health care system in Brazil. Since mayors allocate health care spending on the ground, the structure of the decentralized health care system plays a critical role in constraining the strategic options available to the mayor in allocating the health funds at his disposal. The relevant points are summarized below.

1. The mayor exerts only marginal control over the size of the municipality's total health care budget.[3]

2. The mayor has a high level of control over the allocation between different health services within his municipality. Given the total health budget, he chooses how to divide the health funds between primary care and high complexity (hospital) services.

3. Within the health sector, the very poor and the better-off vary in their demands for primary care services relative to high complexity hospital services. The poor tend to have high demand for both services, whereas the better-off often buy primary care services in the private sector and favor high public spending on hospital services.

The legal groundwork for decentralizing the health care system in Brazil was established in the 1988 Constitution. However, the process referred to as the "municipalization" of health services (the transfer of the principal responsibility for health care implementation to the local level) occurred gradually over the decade of the 1990s (Guanais de Aguiar, 2006). Due to previous underfunding, a constitutional amendment was passed in 2000 which set minimum standards for federal, state and municipal government contributions to the municipality's total health budget. The federal government provides resources on a largely per

[3]The mayor is subject to a spending floor, but may increase spending beyond this floor. Therefore, in the empirical section I still include statistical control for the size of the total health care budget.

capita basis. States are required to contribute at least 12% of their revenues to the health budget and municipalities, 15% (World Health Organization, 2010). The mayor is charged with establishing the annual budget priorities; the agenda then goes to the city council for approval. At this stage it can be amended. The mayor must approve the final version. (Müzell de Oliveira, 2009). Despite the mayor's strong influence over allocation priorities, the fact that the minimum contribution standards for each level of government are laid out in the constitution means the mayor has little control over the size of the total health budget—the caveat being that he may *increase* the proportion of municipal revenues allocated to total health spending. He may not, of course, alter the size of intergovernmental transfers from the state or federal governments or drop below the floor for municipal spending.

Given the health care resources at his disposal and his role in setting the budgetary priorities, the mayor's primary strategic choice is a matter of allocation between different health services. There are two discrete health service constituencies in Brazil. For this reason, the system is often described as being "two-tiered" (World Health Organization, 2010).[4] One group is made up of the better-off—primarily people with formal, public or private sector employment. This group tends to have access to superior state-subsidized health services, including highly specialized treatment and advanced medical technology.[5] About 23% of the most affluent Brazilians are covered by a private health care plan (The Economist, 2011; Affat, 2012; Gordon, Xu and Xie, 2012). Not all of the "old" middle-class (often unionized, formally employed workers as well as public servants) have a private health

[4]This class-identified partition in use of health services is rooted in Brazilian bureaucratic history and reflects its pre-2000s class structure (Haines, 1993). A law that first guaranteed public health resources to the formally, privately employed was introduced in 1923. Very limited services were later added for those not in the formal, private sector. This two-tier system remained official until the passage of the 1988 Constitution. Among the constitutional reforms came the guarantee of universal health care access. The aim was to merge the structures by creating a single Ministry of Health and renaming the two systems under the joint rubric, the National "Unified Health System," or *SUS*. Somewhat ironically named, the legacy of the historic two-system division continues to unofficially permeate the Unified Health System. The two are now organized under different branches of the *SUS* (Elias and Cohn, 2003; The Economist, 2011).

[5]This occurs because cutting-edge medical technology is often available at hospitals in affluent areas that are public-private partnerships. It is common in these cases for the private administrators of hospitals to serve privately-insured clients using public resources. It is also common for those who can afford to initially pay out-of-pocket for high complexity services to later request public reimbursement.

plan. However, out-of-pocket expenditures on individual private services are a common substitute for insurance for this group (Domínguez Ugá and Soares Santos, 2007). With or without private health care plans, the better-off often consume many primary health care services in the private sector, but rely on the public hospital system for expensive high complexity hospital services.

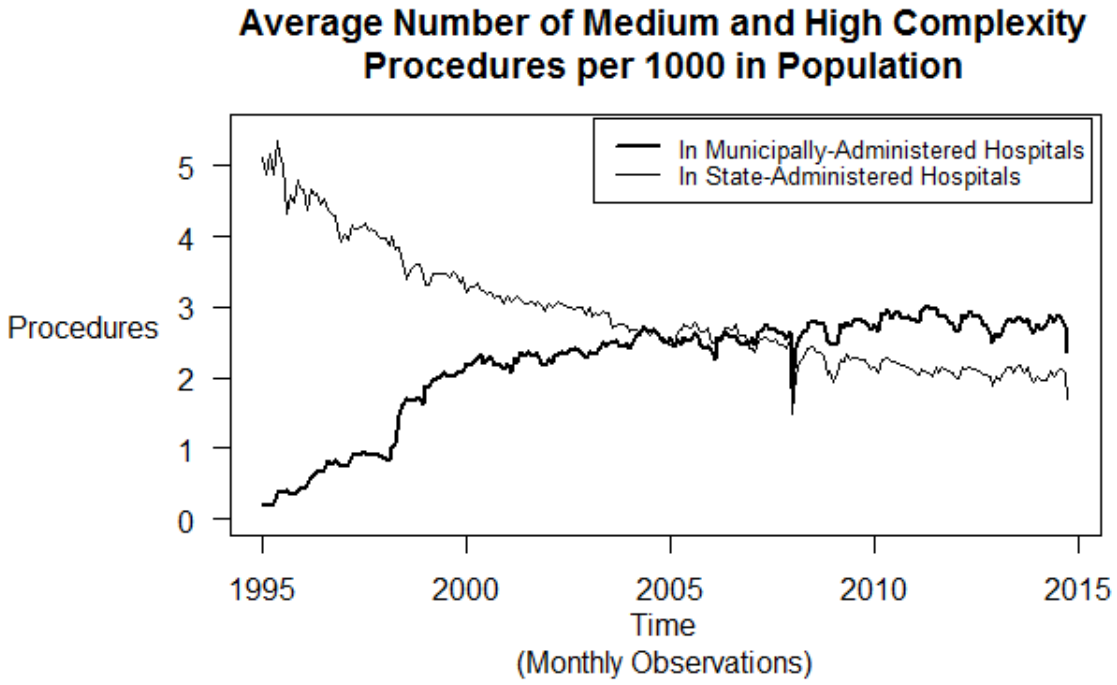
The other group includes poorer voters—often informal laborers (estimated at 43.8% of the population (Paim et al., 2011)) or agricultural workers—who lack a private health insurance plan, the funds to pay out-of-pocket, or the time and resources to advocate for state reimbursement for private care received (Haines, 1993; Hudson, 1997; Elias and Cohn, 2003; The Economist, 2011; Affat, 2012; Gordon, Xu and Xie, 2012; Gerschman, 2013). The latter group, which depends heavily on public clinics for primary health care, tends to deal with long waits, absent doctors and the possibility that their clinic will lack resources as basic as prescription pads (World Health Organization, 2010).

Provision of public primary care services is exclusively the responsibility of municipal governments. Expenditures on primary care go toward financing local clinics, which provide vaccines, check-ups, first-stop treatment for illness, and serve as a gateway into the public health care system for those who lack private insurance. Primary health care expenditures also fund the public provision of basic medications (*Farmácia Popular*) as well as the Family Health Program (*Programa Saúde da Família*), initiated under President Cardoso in the 1990s with an explicitly pro-poor mission—to send doctors and nurses into poor communities that otherwise lack access to primary health services to provide holistic preventative care (Gerschman, 2013).

The funding and administration of public hospitals (and publicly-contracted private hospitals) is split between municipalities and states. As the health care system has become more decentralized, the municipalities have increasingly taken over a larger share of the burden of hospital provision. In many cases, smaller municipalities lack their own hospitals but have pacts with neighboring municipalities to share expenses for a regional hospital, typically

located in a larger municipality, that serves all municipalities included in the pact. Figure 1 below shows the evolution of the provision of medium and high complexity hospital services over time by level of public administration. It tracks the monthly population-weighted municipal average number of medium and high complexity services per 1,000 people in the population provided in state-administered hospitals compared to municipally-administered hospitals. It shows that municipalities have become responsible for the majority of these types of procedures over time (while they continue to be solely responsible for public primary care services).

Figure 1: Increasing Municipal Role in High Complexity Health Service Provision



Mayors, thus, increasingly face a tradeoff with respect to the allocation of health funds to primary care and hospital services. In fact, the municipalities sampled in the survey that I describe in detail in Appendix E had a correlation coefficient of -0.94 between changes in primary health care expenditures and changes in hospital care expenditures from 2011 to 2012 (i.e., the year leading up to the 2012 mayoral elections). The correlation coefficient

for these municipalities between the total level of per capita spending on primary care and hospital care was -0.99. Together the two service categories account for 86% of municipal health care spending.[6] This provides support for the premise that health service allocations primarily go to either one type of service or the other. Development scholars and professionals have also noted the tradeoff. For example, World Bank experts have observed that "too much of the [health care] budget still goes to hospitals, rather than the Family Health Programme" (The Economist, 2011). An article from the National Institutes of Health comments that the Brazilian system's "limited financial resources have been overconcentrated on health care in the hospital sector...If primary care in Brazil can be improved it could help to narrow the health divide between rich and poor" (Haines, 1993).

This tradeoff is important to voters. The prior evidence suggests that voters care a lot about health services, so making a careful allocation decision is worth the mayor's effort. The Economist reports that since 2007, health care has surpassed the economy as the most important issue to voters (The Economist, 2011). Furthermore, middle class consumers report that obtaining private health insurance is their number one goal after buying a home (Affat, 2012).

The class-identified health service dichotomy is not unique to Brazil. In fact, Brazil is one of the only countries in Latin America that still does not officially divide health care into a two-part system (The Economist, 2011). Two-tiered systems have also been recently adopted in other developing and middle income countries (McPake, Hanson and Adam, 2007). One pessimistic analysis indicates a strong likelihood that primary health care will end up subsidizing high quality services for the wealthy, rather than the other way around (McPake et al., 2004). While the present research focuses on the Brazilian case, this type of analysis may be generalizable to many other unequal democracies with similarly tiered health systems.

[6]The remainder is allocated to health surveillance, administrative costs and specific programs.

4 The Argument

In my model, a vote-maximizing, tactically-spending incumbent politician makes a spending allocation decision between two competing services. For ease of application to my empirical case, I will refer to the incumbent politician as "the mayor" and the two services competing for a budget as (municipal) "primary care" and "hospital care" services. If some members of society prefer spending on primary care services and some members prefer hospital care services, the mayor faces a spending tradeoff with respect to these two groups. I argue that the mayor's allocation will be biased in favor of the preferences of the group whose votes are most responsive to a spending shift between these services. I use the model to show that factors other than group size affect this responsiveness. In particular, the group with more asymmetric preferences over the two services has a more responsive expected vote function than the group with more symmetric preferences—even if the total health service demands of the more symmetric group are greater in absolute terms.

These results have implications for the voting influence of the more state-dependent when this group has 1) a different ordering of preferences over services than do the less dependent, and 2) more symmetric preferences than the less dependent. The implications further suggest that when the poor's high dependence (relative to better-off voters) on public services is more symmetrically split across multiple services, they will face a systematic disadvantage in voting influence. This disparity in public service dependence between the poor and the better-off is likely to be most pronounced in unequal democracies.

4.1 An Illustrative Model

Suppose individuals, indexed by i, may be classified into two types of voters, with type indexed by $k \in \{P, W\}$. For ease of later empirical applications I will arbitrarily call these voter types "Poor Paulo" and "Wealthy William," respectively. Further suppose the typical

voter of type k has a utility function given by

$$U^{\{k\}} = \alpha^{\{k\}} + \beta_P^{\{k\}} x + \beta_H (1 - x),$$

where x is the mayor's allocation to primary care services, $1 - x$ is the mayor's allocation to hospital services, $\alpha^{\{k\}}$ represents utility for type k that is not conditional on the mayor's health allocation, $\beta_P^{\{k\}}$ represents the type-specific responsiveness to the primary care allocation x, and β_H specifies the generic responsiveness of individuals of any type to the hospital care allocation $1 - x$.

Assuming voters of the same type have the same utility function, which varies only in the individual's belief about the opportunity costs of not voting for the non-incumbent candidate, ϵ may be added to generalize the function across many voters,

$$U_i^{\{k\}} = \alpha^{\{k\}} + \beta_P^{\{k\}} x + \beta_H (1 - x) + \epsilon_i,$$

where $E[\epsilon] = 0$.[7] We can think of ϵ_i as being the individual's assessment of all other vote-relevant factors, including beliefs about the mean quality of the non-incumbent candidate pool, with all individuals' assessments drawn from the same distribution.[8] Then the expected probability an individual votes for the incumbent mayor can be expressed as a function of the type-specific utility function, $\mathrm{P(V{=}1)} = f(U^{\{k\}})$. The functional form of the mapping from utility onto voting propensity is determined by the cumulative distribution of assessments,

[7] Here, to compare different utility functions I assume all individual utilities are scaled (normalized) such that β_H is equal in all utility functions and α, β_P and ϵ are defined relative to β_H.

[8] The electoral response to the mayor's service allocation decision depends somewhat on the particular notion of accountability one adopts. This paper uses the notion of accountability offered by Ferejohn, rather than the classical Downsian model. In the Downsian model, voters compare the incumbent's past actions with expectations about the challenger's future performance in making their electoral decision (Downs, 1957). In Ferejohn's work, the voter only derives information from past actions, not promises about the future, and so re-election bids are treated as a referendum on the incumbent alone (Ferejohn, 1986). Besley nicely synthesizes these two models by making the "threshold" against which the incumbent is evaluated the prior mean of the quality of the candidate pool—consistent with the Ferejohnian notion that the election does not provide additional information about the challenger that can be used to update the voter's beliefs (Besley, 2006). The model developed here also treats voting as a referendum on the incumbent.

ϵ_i, across voters (I assume the same distribution of ϵ_i across types). I further assume that $f(U^{\{k\}})$ is a continuous, differentiable function. It follows that the function output falls in the range $[0, 1]$ and that $f'(U^{\{k\}}) \geq 0 \ \forall \ U$. Thus, the expected probability an individual votes for the incumbent mayor is (weakly) increasing in her utility from the health allocation as well as utility derived from other sources.

Assuming that voter assessments are informed by small, independent, additive factors, the Central Limit Theorem implies it is reasonable to model ϵ as normally distributed, as I will do from here forward. Each voter type, then, has a probit function for the probability a group of individuals of that type vote for the incumbent mayor, given by

$$\Phi\left(\alpha^{\{k\}} + \beta_P^{\{k\}} x + \beta_H(1-x)\right),$$

where Φ represents the normal cumulative distribution function.

Suppose "Poor Paulo" depends relatively more on public primary care services than on hospital services, while "Wealthy William" relies on public primary care relatively less than hospitals. The marginal linear response rates of the voter's utility function to the allocation of x are as follows.

$$\beta_P^{\{P\}} > \beta_H > \beta_P^{\{W\}} > 0 \tag{1}$$

That is, "Poor Paulo" would rank public primary care as more important than public hospital care (even if he depends on both of these public services to a high degree). "Wealthy William" depends on public hospital care as much as "Poor Paulo" and would rank it as more important than public primary care.[9] The utility function of "Poor Paulo" is, thus, more dependent on state-provided health services than is that of "Wealthy William," since

$$\beta_P^{\{P\}} + \beta_H > \beta_P^{\{W\}} + \beta_H.$$

[9]Suppose, to give a concrete motivation, "Wealthy William" has access to privately-consumed primary care substitutes while "Poor Paulo" does not.

The function that translates utility into vote propensity maps all response rates onto a comparable 0-to-1 scale.[10] It is this vote responsiveness that matters to an incumbent mayor who is a tactical spender (and not the degree of state dependence of the voter, which is related but not identical). If all voters are of the "Poor Paulo" type, since $\beta_P^{\{P\}} > \beta_H$, an incumbent employing tactical spending would prefer to spend all or most of the funds on primary care. If all voters are of the "Wealthy William" type, since $\beta_H > \beta_P^{\{W\}}$, a tactical-spending incumbent would prefer to allocate the funds principally to hospital care. In reality, we do not have homogenous voters (where all voters can be represented by a single stochastic utility function). Here, I allow groups of voters to be represented by either the "Poor Paulo" or the "Wealthy William" type of voting functions. There is some distribution of the two types of voters in society where w_P is the proportion of the population with utility best estimated by the "Poor Paulo" probit and $1 - w_P$ is the proportion best represented by the "Wealthy William" probit. We can, thus, represent the total expected vote return for the incumbent as the proportion-weighted linear combination of the two probits,

$$E[V|x] \;=\; w_P\Phi\left(\alpha^{\{P\}} + \beta_P^{\{P\}}x + \beta_H(1-x)\right) + (1-w_P)\Phi\left(\alpha^{\{W\}} + \beta_P^{\{W\}}x + \beta_H(1-x)\right).$$

The incumbent's optimal allocation, x^*, given that she prefers to maximize her vote share may be calculated by setting the derivative of the voting function with respect to x equal to zero and solving for x. That is, the incumbent mayor wants to choose x to satisfy

$$\underset{x}{\text{argmax}}\; w_P\Phi\left(\alpha^{\{P\}} + \beta_P^{\{P\}}x + \beta_H(1-x)\right) + (1-w_P)\Phi\left(\alpha^{\{W\}} + \beta_P^{\{W\}}x + \beta_H(1-x)\right).$$

For those interested, the maximization proof of and mathematical solution for the mayor's optimal allocation decision, x^*, are provided in Appendix A.

[10] Response rates can thus be interpreted as marginal rates of substitution.

4.2 Comparative Statics

To get a sense for the relative influence of the preferences of voters of each type on the optimal tactical health care allocation for the mayor, I examine how x^* changes when the parameter values change. Below I provide comparative statics to illustrate two theoretical implications of the model regarding *group size* and *relative preference asymmetry. Group size* may be understood as movement in w_P. As w_P grows, "Poor Paulo" becomes a larger proportion of the population. I use the term "preference asymmetry" to refer to how much larger or smaller one group's valuation of public primary care is than the same group's valuation of public hospital care. For example, as $|\beta_P^{\{P\}} - \beta_H|$ grows, the preferences of "Poor Paulo" become more asymmetric. *Relative preference asymmetry* refers to the difference in preference asymmetry between groups. So, the preferences of "Wealthy William" become relatively more asymmetric with respect to the preferences of "Poor Paulo" as $|\beta_P^{\{W\}} - \beta_H| - |\beta_P^{\{P\}} - \beta_H|$ grows. So *relative preference asymmetry* is a difference-in-differences measure of the health service valuations of the two groups.

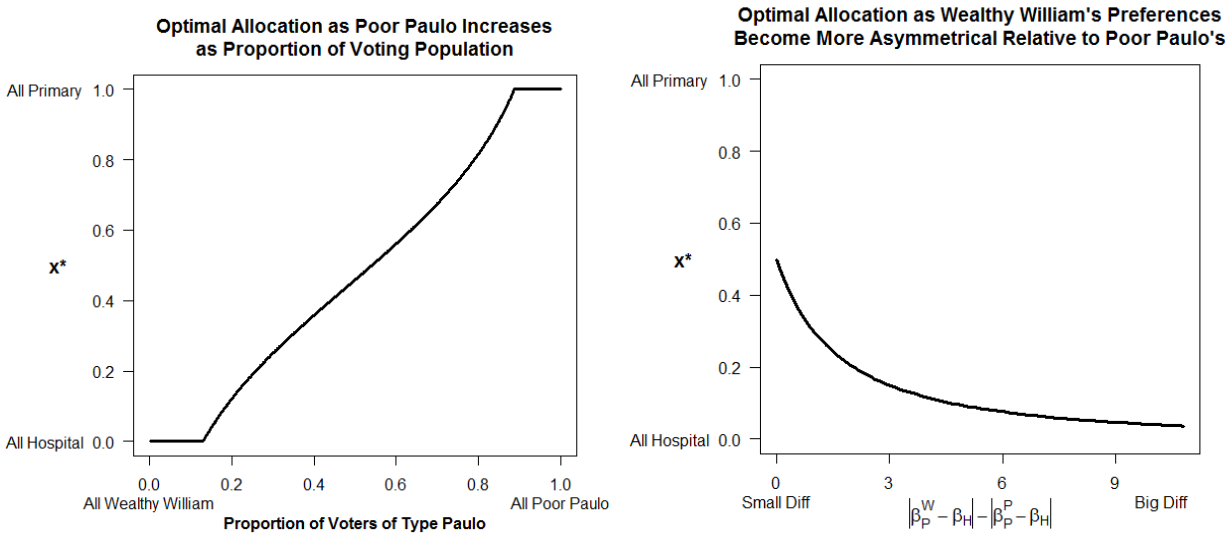
1. *Group Size.* Intuitively, there exists a positive monotonic relationship between the influence of a voter type on the optimal allocation and the proportion of the voting population that is of that type (see the first plot in Figure 2.1 below).[11]

2. *Relative Preference Asymmetry.* As W's preferences become more asymmetrical relative to P's, W also becomes a more responsive voter relative to P. The incumbent mayor's optimal allocation thus becomes more sensitive to type W's preference ranking relative to type P's. This implication corresponds to the conventional wisdom about the weight of single-issue voters in elections.

The first implication is also the central logic of (a stochastic interpretation of) Meltzer and Richard's canonical model. In the stochastic version, a group's policy leverage is pro-

[11]The specific shape of the weakly increasing function is an artifact of the choice to model individuals' beliefs about the quality of non-incumbents as being normally distributed across voters; a different cumulative distribution function would produce different subtleties in prediction, but support the same directional implications.

Figure 2: The Influence of Group Size and Relative Preference Asymmetry



Both plots hold $\alpha^{\{P\}} = 4 - \beta_P^{\{P\}}$ and $\alpha^{\{W\}} = 4$. This normalizes the vote response rate of types P and W to be the same when the type gets its most preferred allocation. The first plot holds $\beta_P^{\{P\}} = 1.05$, $\beta_P^{\{W\}} = 0.18$ and $\beta_H = 1$ constant while w_P changes. The second plot holds $w_P = 0.5$, $\beta_P^{\{P\}} = 1.1$ and $\beta_H = 1$ constant while $\beta_P^{\{W\}} = 0.9 - asymmetry$ moves (increasing in asymmetry).

portional to group size (rather than policy being determined by a dictatorship of the median voter). In my model, therefore, "Poor Paulo," who would like the allocation $x = 1$, gets $x^* = 0.36$ when 40% of voters share his preferences (for the parameter values set in Figure 2.1). When 60% share his preferences, $x^* = 0.56$. This contrasts with the canonical, deterministic median model, in which, when "Poor Paulo" makes up 40% of the population, $x = 0$, and when "Poor Paulo" makes up 60% of the population, $x = 1$.

The second implication also updates our understanding of Meltzer and Richard. Where the better-off have more asymmetric service preferences than the poor (possibly due to fewer public service demands), the better-off will be more responsive to service spending than the poor. Thus, vote-maximizing incumbent mayors will have the incentive to put more weight on the preferences of the better-off, which is especially important when the poor have a different preference-ordering. Foreshadowing, note that any treatment that alters health service consumption behavior of some subset of the voting population will

likely have additional spillover effects on local public service distribution. This will occur whenever the consumption shift alters group vote responsiveness to local service spending by changing group size or the relative preference asymmetry between groups.

5 Empirical Approach

The empirical approach consists of contrasting two findings from the survey data: reported group demand with observed group vote responsiveness to service spending.

5.1 Self-Reported Demand

I estimate self-reported consumption patterns and demand for poor voters and better-off voters respectively to establish preference ordering of service spending on primary care and hospital care for the two groups. I use two survey questions to get at demand. The first captures valuation as measured by usage. It asks (in Portuguese)[12] "when you or someone in your family is sick, where do you typically go first?" Options included a private clinic, public clinic, hospital, pharmacy, or other. If my model is descriptively accurate for the case of Brazilian health care, the following two hypotheses should hold.

H_1: The poor report using public clinics more than do the better-off.

H_2: The poor report using hospitals at similar rates to the better-off.

The second is a more direct measure of demand. It asks, "on which item is it most important for the government to spend money? Order the items from most important (1) to least important (4).[13] The items included social security, social assistance for the poor, public primary care services, and hospital services. If my model is descriptively accurate for the case of Brazilian health care, the following two hypotheses should also hold.

[12] "*Quando você ou alguém na sua família está doente, aonde você tipicamente vai primeiro?*"

[13] "*O qual é mais importante para o governo gastar dinheiro? Enumere em ordem do mais importante (1) ao menos importante (4).*"

H_3: More than 50% of the poor rank primary as more important than hospital spending.

H_4: Less than 50% of the better-off rank primary as more important than hospital spending.

5.2 Vote Responsiveness to Health Service Spending

I estimate voter responsiveness to spending on primary care, conditional on total spent on primary and hospital care combined. First I compare the better-off to the poor in terms of responsiveness. I confirm that both groups respond in the direction one would predict from the demand results, but as the model predicts, the strength of the vote responsesiveness differs greatly between the two groups.

I also compare poor recipients of a federal program, *Bolsa Família*, that decreases dependence on public primary care services with poor non-recipients of the program. *Bolsa Família* alters the needs of a subset of poor voters with respect to public primary care services. It is a formulaic, non-discretionary conditional cash transfer program that makes direct federal transfers to female heads of household when they send their children to school and to preventative doctor's visits. As a group, recipients experience health benefits from improved access to nutrition (Medici, 2011) and nearly a quarter of recipient families report spending part of their transfer funds on privately procuring medications each month (Ministério de Desenvolvimento Social, 2008).[14] These are services that would otherwise typically be provided locally through public primary care. As a result, *Bolsa Família* decreases the dependence of recipients on local government-provided primary care services. By decreasing the dependence of the recipient poor on public provision of primary care services, the Program provides a negative shock with respect to the total dependence of the recipient poor for public primary care services, while leaving the needs of the non-recipient poor unaltered.[15]

[14]Though the program is conditioned on periodic use of primary care, it changes recipients' usage of primary care to more preventative rather than curative and palliative treatment, which improves baseline health, as do the cash transfers themselves, both decreasing state dependence for basic care.

[15]See Appendix B for an analysis of the validity of the claim that the non-recipient poor provide a

Thus, there are three relevant voter types including two counterfactuals (the non-recipient poor and the better-off) and one treatment group (the recipient poor). Let $k \in \{pR, p\bar{R}, w\}$ indicate the income group identifier and transfer status of voter i in municipality j for poor recipients, poor non-recipients, and the better-off, respectively. Let $\gamma^{\{k\}}$ denote the responsiveness to public primary care of individuals in group k *conditional* on total health care spending and ψ denote the generic responsiveness of any group to spending on health care in general, including primary and hospital care. I expect the estimate of ψ to be positive; that is, I expect individuals to prefer more health spending to less, on average. This means $\gamma^{\{k\}}$ is not constrained to be positive. In fact, directionality indicates voter type: given a positive attitude toward increases in health spending in general, the voter can respond positively or negatively to an allocation of these funds toward primary care. Holding the total health budget constant, any shift in spending favoring primary care is inherently a shift away from funding hospital care and vice versa.

In the empirical section, I use the response to the *change* in allocation rather than the allocation *level* because there is only moderate change from year-to-year and because the change is less likely to be correlated with unobserved municipal variables. I also control for the level of expenditure in the previous year to isolate the reaction to the recent change. Let δ_j denote the change in the level of the fixed health budget from 2011-to-2012 and let x_j denote the proportion of that budgetary change allocated to primary care in municipality j in 2012 (the election year).

I also treat the measures of health spending as being rivalrous (multiple individuals cannot consume the same service at the same time, which is descriptively accurate for most medical services).[16] It then makes sense to measure the level and change in primary care allocation and the size of the total health budget in some sort of per capita terms. Since, as detailed in the background section of this chapter, public primary care services are more heavily used by the poor whereas need for public hospital services is more universal I measure

counterfactual for the recipient poor.

[16]Take, for example, a paper prescription, an hour with the doctor, a vaccine, etc.

the level and change in allocation to primary care services per poor head, as a practical representation of its usage. I measure the level and change in the total health care budget in *per capita* terms. Let n_j denote the size of the poor population in municipality j and N_j denote the size of the whole population in that municipality. Then $\gamma^{\{k\}}$ measures the linear responsiveness of individuals in each group, k, to a unit increase in $\frac{x\delta_j}{n_j^p}$, or a one-*real* (the Brazilian currency) increase in primary care spending per poor head *conditional* on the change in the total health budget *per capita* $\frac{\delta_j}{N_j}$.

Various demographic and political vote predictors are represented by the vector of random variables, Z_i. The constant, $\alpha_j^{\{k\}}$ represents any general (dis)advantage of incumbency with respect to the group, k. I model this incumbency (dis)advantage as a random effect, varying across municipalities. An individual voter, i, in municipality j has a systematic component to their vote choice (a linear combination of $\frac{x\delta_j}{n_j^p}$, $\frac{\delta_j}{N_j}$ and Z_i), and an idiosyncratic one, ϵ_i, observed by neither the mayor nor the researcher. I model the individual voter response function as follows, where individual i belongs to group k.

$$\begin{aligned} \alpha_j^{\{k\}} + \gamma^{\{k\}}\frac{x\delta_j}{n_j^p} + \psi\frac{\delta_j}{N_j} + \lambda Z_i + \epsilon_i \qquad (2) \\ \epsilon_i \sim\ N(0, \sigma^2) \end{aligned}$$

Individual i votes for the incumbent mayor if Equation 2 evaluates to some number greater than 0 and, otherwise votes against the incumbent.

$$\begin{aligned} Pr(y_{ij} = 1) &= Pr(\alpha_j^{\{k\}} + \gamma^{\{k\}}\frac{x\delta_j}{n_j^p} + \psi\frac{\delta_j}{N_j} + \lambda Z_i + \epsilon_i > 0) \\ &= \Phi(\alpha_j^{\{k\}} + \gamma^{\{k\}}\frac{x\delta_j}{n_j^p} + \psi\frac{\delta_j}{N_j} + \lambda Z_i) \qquad (3) \end{aligned}$$

In Equation 3, Φ represents the standard normal cumulative distribution function.

I estimate $\alpha_j^{\{k\}}$, $\gamma^{\{k\}}$, ψ, and λ using original survey data collected during Brazil's 2012 municipal elections. The number of within-municipality observations is too small for

independent analyses for each municipality. Instead, I employ a partial-pooling (shrinkage) estimator, allowing municipalities to "borrow" strength from out-of-municipality observations informing the grand (pooled) mean. Equation 3 gives us the following model.

$$\begin{aligned} y_{ij} &\sim \ Bernoulli(\pi_{ij}) \\ \pi_{ij} &= Pr(\alpha_j^{\{k\}} + \gamma^{\{k\}} \frac{x\delta_j}{n_j^p} + \psi \frac{\delta_j}{N_j} + \lambda Z_i + \epsilon_i > 0) \\ \epsilon_i &\sim \ N(0, \sigma^2) \end{aligned} \tag{4}$$

The voter types, k, enter the model as interaction terms for the intercept, α_j, and the coefficient on primary care spending, γ. The vector of parameters, λ, may be interpreted as the relationship between several municipal, political and demographic characteristics and the linear propensity for individual i to vote for the incumbent mayor. The municipal variables attempt to address factors outside of the mayor's allocation decision that year which may alter the impact of a given shift toward or away from primary care spending. These include a measure of the *per capita* level of municipal budget expenditures on health and per poor spending level on primary care in the previous budgetary year. They also include the change in the size of the total health budget *per capita* for this budgetary year. Additional municipal-level factors include the size of the municipal population and the percentage of that population I classify as "poor."

The estimated voter response function also accounts for the influence of various individual-level political and demographic characteristics. Though relatively few survey respondents reported "preferring one political party to the others," for those that did report a party preference, preferring the mayor's party is a strong predictor of voting for the incumbent. In addition to an indicator for whether the respondent reported preferring the mayor's party, individual level predictors include age, sex, and *per capita* household income.

If my model is descriptively accurate for the case of public health spending in Brazil, the following hypotheses should hold.

H_5: The average voter responds positively to health spending, or $\psi > 0$.

H_6: Conditional on total health spending, the non-recipient poor respond positively when more money goes toward primary care, or $\gamma^{\{p\overline{R}\}} > 0$.

H_7: Conditional on total health spending, the better-off and the recipient poor respond negatively when more money goes toward primary care, or $\gamma^{\{w\}}, \gamma^{\{pR\}} < 0$.

H_8: The non-recipient poor are less responsive to shifts in health spending than are the better-off and the recipient poor, or $\left|\gamma^{\{p\overline{R}\}}\right| < \left|\gamma^{\{w\}}\right|, \left|\gamma^{\{pR\}}\right|$.

5.3 Data

The data I use to classify voters into the three groups and estimate the voter response function of each comes from three sources.[17] The individual covariates and the observations on vote choice come from an original survey implemented within the two weeks prior to the 2012 municipal elections in Brazil. Brazilian enumerators administered the survey face-to-face to a probability sample of 1,200 individuals from across 38 municipalities in the state of Minas Gerais. The sampling frame includes individuals of voting age (≥ 16) in municipalities where the incumbent ran for re-election in 2012. The survey elicited mayoral vote choice without priming respondents on health expenditures. The goal was not to gage cognition of expenditure decisions, but simply to observe the probability of re-electing the incumbent, given the incumbent's observed health expenditure behavior in the last year. The data on municipal finance come from the records of the National Treasury of Brazil. Population data comes from the *Instituto Brasileiro de Geografia e Estatística*, which implements the Brazilian Census. I detail these data sources in Appendices C (survey design and other

[17]The cutoff I use to classify voters as "poor" is *per capita* household income of less than one-half the federal minimum wage in 2012 (in Brazilian currency, 622 *reais*). Approximately 40% of my sampling frame falls in this category according to the 2010 Census microdata. If the parameter values of the first plot in Figure 2 reflect reality, we would expect about 36% of the municipal budget to be spent on primary health care when about 40% of the population is classified as "poor." Compare this to the sample, where the median individual lived in a municipality that spent 22.2% of the health care budget on health in 2012, the mean voter lived in a municipality that spent 40.9%, and the mean (not population-weighted) municipality in the sample spent 58%.

data details), D (justification of the selection of the state of Minas Gerais for the sampling frame), E (survey design summary), F (representativeness of the sample) and G (quality of vote prediction estimates).

While most of the survey questions produced response rates with very little missingness, there was considerable missingness on the vote choice responses (about 50%). This is common in vote choice surveys. Assuming this missingness is not correlated with other important covariates across cases, the analysis benefits from data imputation via an Expectation-Maximization (EM) algorithm. This is an iterative process where the non-missing data are used to fit the model parameters, the model parameters are used to predict missing values of the dependent variable, and the new complete dataset is used to generate new parameter estimates, again. The process cycles until the predicted values for the missing data are identical in two successive iterations. For the hierarchical analysis presented in the results section of this chapter, the results are for the EM-imputed data. See Appendix H for non-EM results. The EM algorithm roughly doubles the sample size of the analysis, though the size and direction of the results of the analysis are effectively identical with or without the data imputation procedure.

6 Results

6.1 Self-Reported Demand

As Table I below shows, the percentage of poor voters who reported going to a public clinic as their first stop for health concerns was 18.7% higher than the same percentage for the better-off. This number is both substantively large and statistically significant at all conventional cutoffs. This suggests that the poor do depend more on public clinics than the better-off, at least for their first visits. In contrast, the difference between the percent of the poor and the percent of the better-off that reported going to hospitals first was not statistically distinguishable. This, again, suggests similar demand among the poor and the better-off for

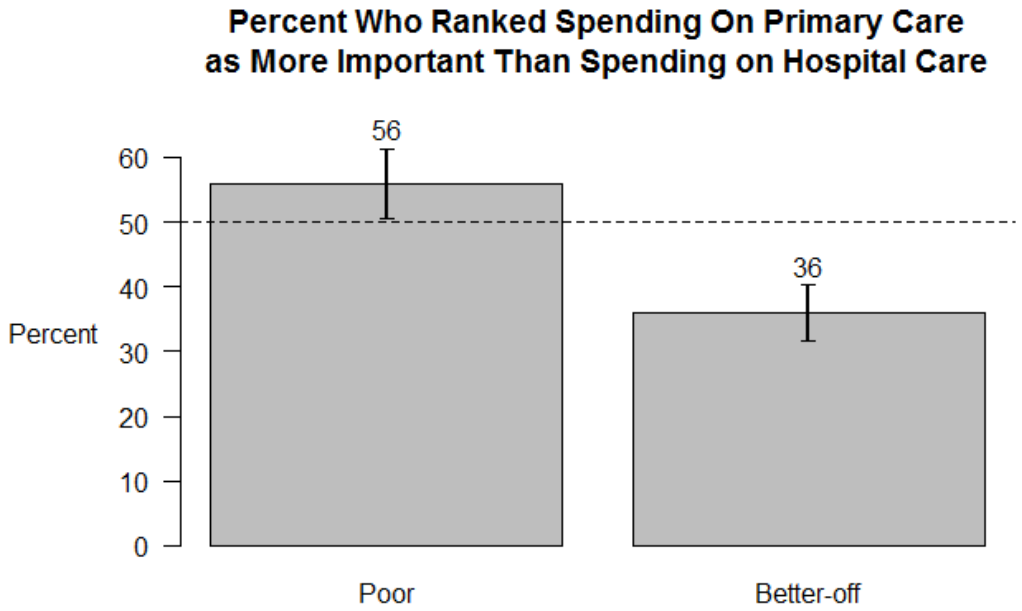
hospital services. These results are consistent with H_1 and H_2.

Table 1: Self-Reported Health Service Usage

	Poor	Better-off	Diff
Public Clinic	61.0%	42.3%	18.7***
	(2.53)	(2.05)	
Hospital	28.4%	32.2%	-3.8
	(2.34)	(1.94)	

Similarly, as depicted in Figure 3 below, 56% percent of the poor rank government spending on primary care higher than government spending on hospital care, in terms of importance. On the other hand, 64% of the better-off ranked hospital spending as more important. The difference is statistically significant. Notably, though more than 50% of the poor respondents preferred primary care spending, this number is not as far above 50% as the better-off's 36% is below the 50% cutoff, providing some preliminary evidence that the preferences of the better-off may be more concentrated on their preferred service than the preferences of the poor. These results are consistent with H_3 and H_4.

Figure 3: Self-Reported Rankings of Health Expenditures



6.2 Vote Responsiveness to Health Service Spending

Table 5 summarizes the results of the vote responsiveness analysis. The estimates for the key explanatory variables, γ and ψ, appear under the sub-headings "Responsiveness to Primary Care Spending" and "Responsiveness to Hospital Spending," respectively. Recall that H_5 predicts $\psi > 0$, i.e., that voters respond positively to changes in total health spending. The results in Table 2 show that the directionality of this prediction is correct; however, the result is not statistically significant, with a p-value of 0.165.[18] Still, in substantive terms the size of the result is non-trivial. Across municipalities in the sample the marginal increase in the incumbent mayor's vote share associated with an increase in one *real* in health care expenditures per capita was 0.12%. The median increase in health spending across the sampled municipalities in 2012 was 40.64 *reais*.

I then estimate three different responses to changes in primary care spending for the "non-recipient poor," "recipient poor," and the "better-off," respectively. Non-recipients provide a baseline expectation for how poor voters respond electorally to shifts in health spending absent federal transfer receipt, i.e., without a negative shock to their public primary care demands. The sixth hypothesis predicts that the non-recipient poor respond positively to primary care spending, conditional on total health spending, or $\gamma^{\{p\overline{R}\}} > 0$. Since the non-recipient poor are very reliant on the state for all health care needs, I expect them to have relatively symmetrical preferences over the two public health services, and therefore, for the positive response rate to primary care spending to be small. The direction of the result is consistent with the hypothesis, while the magnitude of the positive response to primary care for this group is not statistically significantly larger than their response to total health care expenditure. The small size of the positive primary care response for this group is consistent with a weak preference for primary care, with a high degree of symmetry over preferences for primary and hospital care.

[18] Interestingly, using the logic of my model to interpret this suggests that though Brazilians report caring a lot about public health care services, the tradeoff between this and the next most important issue may be small, which is reflected in their vote response rate to the issue of health expenditure.

The better-off voters provide a different baseline for comparison. The seventh hypothesis suggests that they will be more responsive to hospital spending than to primary care spending. If this is true then $\gamma^{\{w\}} < 0$; that is, once controlling for total health expenditures, primary care expenditures produce a negative response. The results provide statistically significant support for this hypothesis, suggesting the better-off prefer increases in health funding to go to hospital rather than primary care. In fact, in marginal effects, choosing to spend one *real* (per poor head) of health care funds on primary care rather than hospital services is associated with a loss in 0.09% of the incumbent's vote due to the negative response of the better-off. Compare this with a marginal gain in expected vote share of 0.02% from the non-recipient poor for the same one *real* shift. The estimates suggest $\left|\gamma^{\{w\}}\right| > \left|\gamma^{\{p\overline{R}\}}\right|$, providing some support for H_8 that the better-off are more responsive to shifts in health spending between services than are the non-recipient poor. The model implications, thus, suggest that the preferences of the poor will receive less weight in the vote-maximizing mayor's optimal spending allocation than the preferences of the better-off.

The seventh hypothesis also suggests that poor recipients will respond negatively to primary care—deviating from their higher-public primary care-demanding counterparts who do not receive the federal transfer. If this hypothesis is correct, $\gamma^{\{pR\}} < 0$. The results provide statistically significant support for this prediction, as well. The effect is quite large suggesting an asymmetry in favor of hospital care for this group on the same order as the better-off. This is surprising since the transfer amount is small (only large enough to move 8.6% of BFP recipients in my sample past the one-half the minimum wage *per capita* household income cutoff I use to distinguish the poor from the better-off). It suggests assignment to recipient status entails a health-preference-shifting mechanism beyond just increased funds-in-pocket, which merits further investigation. The results suggest that the transfers should decrease the weight mayors place on the health preferences of the poor in two ways: by decreasing their group size and by decreasing their relative voting influence due to increased asymmetry of transfer recipients with opposing preferences. I briefly explore the consequences of this

for health spending in the Discussion section.

6.3 Contextual Variables

A higher *level* of total per capita health spending in the previous year (2011) is negatively associated with the incumbent's voteshare in 2012. This correlation is likely due to the fact that the local executive has a more difficult job with respect to health care provision in municipalities with a higher disease burden, high levels of transit, or high levels of violence. Controlling for this starting level, the *change* in the spending level should not be driven by the geography of disease burden. Interestingly, however, the level of primary care per poor head in 2011 is positively associated with voting for the incumbent.

Generally, the municipal-level indicators were not statistically significant, so the random effect intercept may soak up much of the municipal variation, which is reassuring. Individuals sampled from larger municipalities (cities) were less likely to vote for the incumbent, though not significantly so. This is not surprising as tactical spending is often more efficient in smaller municipalities according to the conventional wisdom. The state capital, Belo Horizonte, is an exception to this rule, where the incumbent is more likely to be re-elected than in the typical municipality in the sample. Individuals sampled from municipalities with a larger percentage of the population classified as "poor" were also more likely to vote for the incumbent, though not significantly so. This result is difficult to interpret directly since it is conditional on controls for the underlying propensity to vote for the incumbent for each of the three income-based groups (the intercept terms).

Table 2: Hierarchical Probit Results

Variable	Coef
Underlying Propensity to Favor Incumbent	
$\alpha^{\{p\overline{R}\}}$ (Intercept: Poor Non-Recipient)	-1.341 0.489 (1.938)
$\alpha^{\{pR\}}$ (Intercept Shift: Recipient)	-0.152 0.415 (0.187)
$\alpha^{\{w\}}$ (Intercept Shift: Better-off)	0.788*** 0.000 (0.166)
Responsiveness to Primary Care Spending	
$\gamma^{\{p\overline{R}\}}$ (Poor Non-Recipient)	0.001 0.727 (0.002)
$\gamma^{\{pR\}}$ (Poor Recipient)	-0.003** 0.009 (0.001)
$\gamma^{\{w\}}$ (Better-off)	-0.003*** 0.000 (0.001)
Responsiveness to Hospital Spending	
ψ Change in Total Health Spending/Cap	0.005 0.165 (0.004)
Health Expenditure Context	
λ_1 Total Health Spending/Cap 2011	-0.001 0.287 (0.001)
λ_2 Primary Care Spending/Poor Head 2011	0.001*** 0.000 (0.000)
Municipal Vote Predictors	
λ_3 Municipal Population (Logged)	0.007 0.961 (0.143)
λ_4 Percent of Pop Classified as Poor	0.020* 0.095 (0.012)
λ_5 Dummy for State Capital	1.526** 0.034 (0.720)

Continues

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Variable	Coef
Individual Vote Predictors	
λ_6 Co-Partisan with Mayor	2.080***
	0.000
	(0.244)
λ_7 Household Income/Cap (Logged)	-0.281***
	0.000
	(0.057)
λ_8 Age	0.012***
	0.000
	(0.003)
λ_9 Female	0.348***
	0.001
	(0.106)

Note: Reported values include the estimate, p-value, and standard error. The ***,**, and * notation denotes statistical significance for a two-tailed t-test (0.01, 0.05, and 0.10 α levels, respectively). The model includes 399 observations with complete data. The standard deviation of the random intercept is estimated to be 0.452.

The individual-level demographic variables were highly predictive of vote choice. Preferring the mayor's party to others strongly predicts voting for the incumbent (though relatively few people report having such a preference).[19] The impact of household wealth on voting for the incumbent is complex (and possibly non-monotonic). Being classified as "better-off" is significantly associated with an increased likelihood of voting for the incumbent. However, conditional on this dichotomous income distinction household income per capita, as a continuous variable, is significantly associated with a decreased probability of voting for the incumbent. This suggests that propensity to vote for the incumbent is different among the moderately-better-off and the very wealthy. Being older and being a woman are both significantly associated with voting for the incumbent.

7 Discussion

The results suggest that a downward shock to the public primary care demands of the poor induced by assignment to the *Bolsa Família* Program is associated with a reversal of the

[19]Just over 12% of those sampled (or about 16.5%, applying inverse-sampling weights) report preferring the mayor's party to other parties)

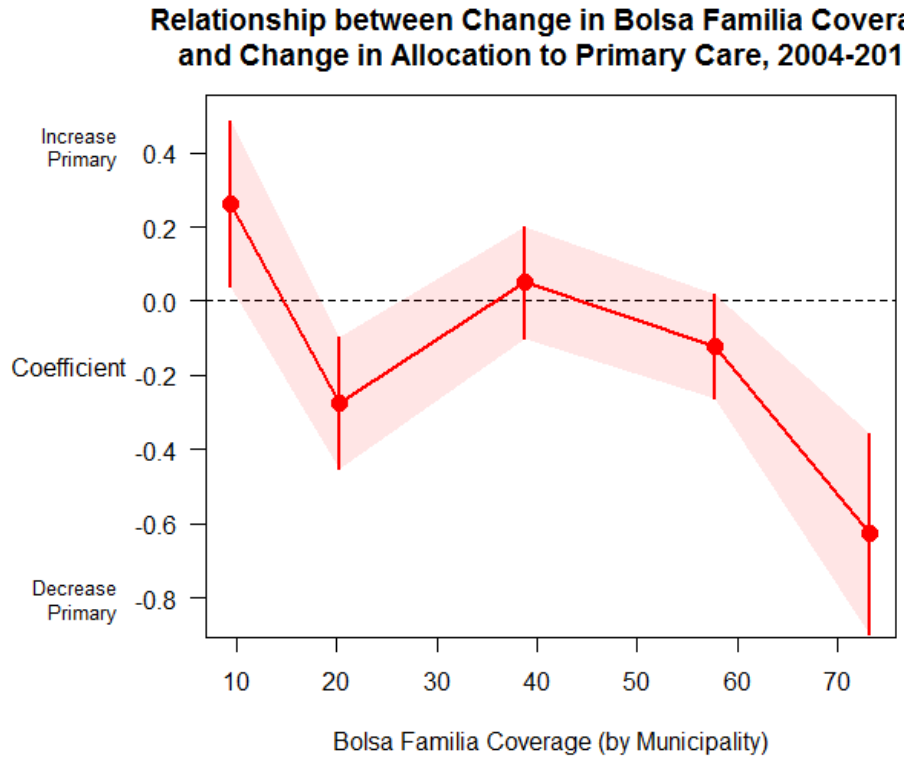
preference ordering of the recipient poor. According to my model, then, *Bolsa Família* assignment in a municipality should weaken the policy influence of the non-recipient poor group in two ways. First, it should decrease the proportion of the population that shares their preference ordering (i.e., it decreases their *group size*). Thus, following the implementation of *Bolsa Família* in October of 2003, we would expect to observe a shift in municipal health spending priorities favoring hospital care associated with the percent of the population assigned to *Bolsa Família*, at the municipal level.

If only the shift in *group size* favoring hospital care were relevant, the size of the spending shift should be proportional to the size of the municipal population assigned to receive *Bolsa Família*. However, my model predicts that *Bolsa Família* should affect health spending priorities by compounding the effect of *group size* and that of *relative preference asymmetry*. That is, assignment to *Bolsa Família* should also increase the vote responsiveness of the recipient poor to spending shifts relative to the non-recipient poor, who do not change. If my argument is correct, therefore, the association between *Bolsa Família* and the movement of health funds toward hospital care should be greater-than-proportional to the size of the recipient population in a municipality. That is, the effect of a unit of *Bolsa Família* coverage in a municipality on primary care allocation should be heterogeneous—it should be larger in municipalities with higher program coverage.

I explore this briefly in the following analysis. The dependent variable is the change in the percentage of the health service budget (totaled over primary and hospital care) that is allocated toward primary care in a municipality from 2004 to 2010. I subdivide municipalities into five roughly equally-sized subgroups according to *Bolsa Família* target coverage rates. I then conduct analyses of the effect of the percentage of the municipal population assigned to *Bolsa Família* on within-subgroup changes in the health service allocation over the six years following the introduction of the Program. Figure 4 shows the estimates for the five groups. The size of the (negative) effect of *Bolsa Família* coverage on primary care allocation seems to increase for municipalities with higher program coverage, consistent with my model's

predictions. The numerical results of this analysis are summarized in Table 3.

Figure 4: Observed Pattern



There are several points of irony worth noting in these findings. The first is that the non-recipient poor have higher absolute demand for health care services, but less influence on how health care service funds are spent. The second is that the non-recipient poor undergo decreased policy influence without having to change their behavior at all. The democratic game is scaled in relative terms. Preference movement from another group changes the influence of all groups on policy. Because it is *relative* preference asymmetry across groups that is important, the non-recipient poor's influence is downgraded simply through increasing the preference asymmetry of a different group (the recipient poor). Third, if my model is descriptively accurate, the non-recipient poor act as rationally as all other groups, but are disadvantaged in policy influence precisely due to their higher level of demand for primary care services.

Following from this last point, this research can help to make sense of cases in which

Table 3: OLS: Dependent Variable—Share of Spending Allocated to Primary Care

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	(Std Err)	(Std Err)	(Std Err)	(Std Err)	(Std Err)
BFP Coverage	0.262*	-0.275***	0.050	-0.120	-0.626***
	(0.134)	(0.109)	(0.092)	(0.085)	(0.164)
Pop (Log)	-2.377***	-1.143*	-2.998***	-6.032***	-10.272***
	(0.663)	(0.674)	(0.754)	(0.914)	(2.330)
Target Coverage (Sq Rt)	-2.920***	-1.259	1.340	-3.718	12.549*
	(1.221)	(1.913)	(1.792)	(3.075)	(7.303)
Presence of Hospital	-3.098***	-0.045	-2.202	-1.026	-3.781
	(1.281)	(1.323)	(1.466)	(1.514)	(3.548)
Percent Rural	-0.048*	0.036	0.033	0.077**	0.086
	(0.029)	(0.028)	(0.030)	(0.038)	(0.090)
Municipal HDI	-0.007***	0.002**	-0.004***	-0.007***	-0.004
	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)
Pop over 200,000	6.249***	-11.579***	2.051	NA	NA
	(2.583)	(3.758)	(4.573)		
Intercept	48.218***	21.069**	30.660***	101.597***	36.902
	(6.880)	(10.422)	(11.239)	(22.361)	(67.888)
N	1,000	1,000	1,000	1,000	975
R^2	0.028	0.009	0.018	0.022	0.060

***0.01 α-level; **0.05 α-level; *0.1 α-level

self-reported preferences differ from observed behavior—an anomaly that is often noted and attributed to the irrationality of voters. My results suggest that the incongruence between reported preferences and behavior in terms of vote responsiveness can, in some cases, be attributed to the fact that demand for services and vote responsiveness to service spending, in fact, measure quite different things. In particular, measures of vote responsiveness include information not just about preference ordering, but also about the salience of the next-best option.

As a final note on rationality, in rational choice analyses, an equally high degree of demand for spending on two services that share a budget is interpreted as indifference between the two. In these analyses, we do not distinguish between indifference caused by similarly high demand for two competing goods (possibly better termed "ambivalence") and indifference caused by similarly low demand for two competing goods, though one might

argue these two are fundamentally different situations. "Indifference," at least colloquially, implies a low cost to a given tradeoff, while "ambivalence" implies a high cost to the tradeoff. This research highlights that, like rational choice analysis, the accountability mechanism in democracy does not distinguish between the low-cost tradeoff and the high-cost tradeoff. It reminds us that perceived indifference can exist concurrently with high demands. This highlights a problem in the logic which suggests higher demands in democracy should always lead to higher yield from accountable politicians.

The research presented in this paper can also contribute to an updated understanding of Meltzer and Richard's claim that unequal democracies should redistribute more than equal democracies (Meltzer and Richard, 1981). My model makes fewer assumptions about the preferences of the poor than does Meltzer and Richard's (in particular, it assumes the poor value public services, but says nothing about the overall attitude of the poor toward redistribution). At the same time, it elaborates additional implications. My model suggests that the central intuition behind Meltzer and Richard's argument (or at least a stochastic interpretation of it) is sound—larger groups should have a larger influence on policy, all else equal. However, the additional implication that results from my model suggests that all other things are often not equal. Another relevant factor is that the preferences of a group that is disproportionately more responsive to one policy than to another will receive greater policy weight from vote-maximizing politicians than groups with more symmetrical preferences, even when the service demands of the latter group are larger. This is consistent with the idea that single-issue voters are more influential in policy decisions than are multi-issue voters.

8 Conclusions and Future Directions

The theoretical model presented in this chapter suggests that tactically-spending, vote-maximizing politicians will put more weight on the preference-ordering of voters who have

more asymmetric preferences over competing public services in their spending alloction decisions. I use survey evidence to illustrate these points in the context of health service spending in Brazil. I estimate reported demand and vote responsiveness to service spending for various social groups to show that the group one would expect to be the most dependent on public health services is the least responsive to shifts in spending across these services, consistent with highly symmetric preferences. The results imply that even when the poor prefer more public service spending and when institutions of democratic accountability are functioning properly, tactically-spending politicians still may have an incentive to put more weight in allocation decisions on the demands of the wealthy when they value fewer services.

It is worth noting that while I have designed the model to describe allocation dynamics across competing public services, there is no reason it could not be generalized to other competing policies or competing goods. The implication that allocation decisions will be biased in favor of voters with more asymmetric preferences still holds. However, it becomes more difficult to predict which group of voters will have the more asymmetric preferences. Though it is reasonable to suppose the better-off have fewer public health service demands than do the poor, it is less clear that the better-off favor fewer macroeconomic policies, infrastructural projects, or electoral goods than the poor. In fact, the conventional notion that the poor are generally easier to buy with cheap, targeted electoral goods because of their disproportionate need for these goods compared to other policies (Stokes, 2005) is consistent with my asymmetry argument. But in this case, the poor make up the more asymmetric group. The interactions between this dynamic and the public service dynamics presented here deserve further investigation.

A final implication of this chapter is that, in democratic contexts characterized by tactical spending by politicians, inequality may be self-perpetuating (the opposite of the Meltzer and Richard hypothesis). Societies that are unequal early in their democratic history may tend to produce elected politicians who are less sensitive to the service preferences of the poor. However, as an optimistic qualifier, a significant body of research also suggests

that programmatic politics can produce economic policy that favors increased equality, suggesting that the persistence of existing inequality need not be inevitable, especially in certain contexts (Iversen and Soskice, 2006; Bartels, 2009).

My research may be contrasted with the literature that models the probability of turnout as a function of preference intensity (Campbell, 1980; Lewis-Beck, Norpoth and Jacoby, 2009). Instead, I consider the implications of having voters with differing levels of preference asymmetry, where voters of all types participate equally in voting. The argument is not, then, that the poor do not hold elected politicians accountable; it is that aggregation of preferences by voting reduces the weight of the preferences of voters with more symmetrical preferences in politicians' electoral calculations. However, it is also worth noting that existing research on turnout dynamics could have ramifications that mediate the effects described by my model. In particular, several researchers have found that when different social groups turn out at different rates it can produce significant deviations in electoral outcomes (Nichter, 2008; Power, 2009; International Institute for Democracy and Electoral Assistance, 2011; Baez et al., 2012; de la O, 2013). These dynamics should be less important in countries that enforce compulsory voting, like Brazil. However, Power presents evidence that in Brazil, despite compulsory voting laws, the middle class and wealthy are more able to evade sanctions for abstaining from the vote (Power, 2009). If the middle class and wealthy are less likely to vote in Brazil than are the poor, this would attenuate the empirical spending implications predicted by my model. I leave this area of study further research.

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Appendices

A Proof of Optimality of x^*

The incumbent wants to choose x to satisfy

$$\underset{x}{\text{argmax}}\ w_P\Phi\left(\alpha^{\{P\}}+\beta_P^{\{P\}}x+\beta_H(1-x)\right)+(1-w_P)\Phi\left(\alpha^{\{W\}}+\beta_P^{\{W\}}x+\beta_H(1-x)\right).$$

First we must obtain the first order conditions. Applying the chain rule,

$$\begin{aligned}\frac{dE[V|x]}{dx} &= w_P(\beta_P^{\{P\}}-\beta_H)\phi\left(\alpha^{\{P\}}+\beta_P^{\{P\}}x+\beta_H(1-x)\right)\\ &+ (1-w_P)(\beta_P^{\{W\}}-\beta_H)\phi\left(\alpha^{\{W\}}+\beta_P^{\{W\}}x+\beta_H(1-x)\right).\end{aligned}$$

Setting this derivative equal to zero, we get

$$\begin{aligned}&w_P(\beta_P^{\{P\}}-\beta_H)\phi\left(\alpha^{\{P\}}+\beta_P^{\{P\}}x+\beta_H(1-x)\right)=\\ &-(1-w_P)(\beta_P^{\{W\}}-\beta_H)\phi\left(\alpha^{\{W\}}+\beta_P^{\{W\}}x+\beta_H(1-x)\right).\end{aligned}$$

Assuming that $1-w_P\neq 0$ and that $\beta_P^{\{W\}}-\beta_H\neq 0$ (both of which are conditions that hold by construction), it follows that

$$\frac{-w_P(\beta_P^{\{P\}}-\beta_H)}{(1-w_P)(\beta_P^{\{W\}}-\beta_H)}=\frac{\phi\left(\alpha^{\{P\}}+\beta_P^{\{W\}}x+\beta_H(1-x)\right)}{\phi\left(\alpha^{\{W\}}+\beta_P^{\{P\}}x+\beta_H(1-x)\right)},$$

which, since the left-hand term is greater than zero (as $w_P,\ 1-w_P>0$ and $\beta_H-\beta_P^{\{P\}},\beta_P^{\{W\}}-$

$\beta_H < 0$ by construction), further simplifies to

$$2\log\left(\frac{w_P(\beta_H - \beta_P^{\{P\}})}{(1-w_P)(\beta_P^{\{W\}} - \beta_H)}\right) = \left(\alpha^{\{P\}} + \beta_P^{\{P\}}x + \beta_H(1-x)\right)^2 - \left(\alpha^{\{W\}} + \beta_P^{\{W\}}x + \beta_H(1-x)\right)^2,$$

Expanding and combining terms we get the quadratic form

$$\begin{aligned} x^2[(\beta_P^{\{P\}} &- \beta_H)^2 - (\beta_P^{\{W\}} - \beta_H)^2] \\ &+ x\left[2(\alpha^{\{P\}} + \beta_H)(\beta_P^{\{P\}} - \beta_H) - 2(\alpha^{\{W\}} + \beta_H)(\beta_P^{\{W\}} - \beta_H)\right] \\ &+ (\alpha^{\{P\}} + \beta_H)^2 - (\alpha^{\{W\}} + \beta_H)^2 - 2\log\left(\frac{w_P(\beta_H - \beta_P^{\{P\}})}{(1-w_P)(\beta_P^{\{W\}} - \beta_H)}\right) = 0. \end{aligned}$$

Solutions for x^* are thus accessible using the quadratic formula,

$$x^* = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},$$

where

$$\begin{aligned} a &= (\beta_P^{\{P\}} - \beta_H)^2 - (\beta_P^{\{W\}} - \beta_H)^2, \\ b &= 2(\alpha^{\{P\}} + \beta_H)(\beta_P^{\{P\}} - \beta_H) - 2(\alpha^{\{W\}} + \beta_H)(\beta_P^{\{W\}} - \beta_H), \text{ and} \\ c &= (\alpha^{\{P\}} + \beta_H)^2 - (\alpha^{\{W\}} + \beta_H)^2 - 2\log\left(\frac{w_P(\beta_H - \beta_P^{\{P\}})}{(1-w_P)(\beta_P^{\{W\}} - \beta_H)}\right). \end{aligned}$$

The optimal strategy must lie in the interval $[0, 1]$, which makes it possible to select the logical solution from the two quadratic formula outputs (which turns out to be the larger of the two outputs). Since x cannot be less than zero or greater than one, the solution provided sometimes produces corner solutions ($x = 0$ when the optimum is less than zero and $x = 1$ when the optimum is greater than one).

Next we must prove the second order conditions, that the second derivative of $E[V|x]$

evaluates to a negative number at the proposed x^*. Taking the second derivative of $E[V|x]$, we get

$$\begin{aligned}\frac{dE[V|x]}{dx} = & \frac{w_P(\beta_P^{\{P\}}-\beta_H)}{\sqrt{2\pi}}\left[-\frac{1}{2}\left(2(\beta_P^{\{P\}}+\beta_H)(\beta_P^{\{P\}}-\beta_H)+2x(\beta_P^{\{P\}}-\beta_H)^2\right)\right]* \\ & \exp\left\{-\frac{[(\alpha^{\{P\}}+\beta_H)^2+2x(\alpha^{\{P\}}+\beta_H)(\beta_P^{\{P\}}-\beta_H)+x^2(\beta_P^{\{P\}}-\beta_H)^2]}{2}\right\}+ \\ & \frac{(1-w_P)(\beta_P^{\{W\}}-\beta_H)}{\sqrt{2\pi}}\left[-\frac{1}{2}\left(2(\beta_P^{\{W\}}+\beta_H)(\beta_P^{\{W\}}-\beta_H)+2x(\beta_P^{\{W\}}-\beta_H)^2\right)\right]* \\ & \exp\left\{-\frac{[(\alpha^{\{W\}}+\beta_H)^2+2x(\alpha^{\{W\}}+\beta_H)(\beta_P^{\{W\}}-\beta_H)+x^2(\beta_P^{\{W\}}-\beta_H)^2]}{2}\right\}.\end{aligned}$$

We know that the exp operator produces positive output and that $\beta_P^{\{P\}} > \beta_H$ by construction, so the first term is negative for all x, including for x^*. If the second term in the expression is also negative when evaluated at x^* then we know the whole expression is negative, which is a sufficient condition to prove the solution is a maximum. Since $\beta_P^{\{W\}} < \beta_H$ by construction, the second term evaluates to a negative number at x^* only if

$$2(\alpha^{\{W\}}+\beta_H)(\beta_P^{\{W\}}-\beta_H)+2x^*(\beta_P^{\{W\}}-\beta_H)^2 < 0,$$

which is true as long as

$$x^* > \frac{\alpha^{\{W\}}+\beta_H}{\beta_P^{\{W\}}-\beta_H}.$$

This condition holds for all the comparative statics shown in this paper.

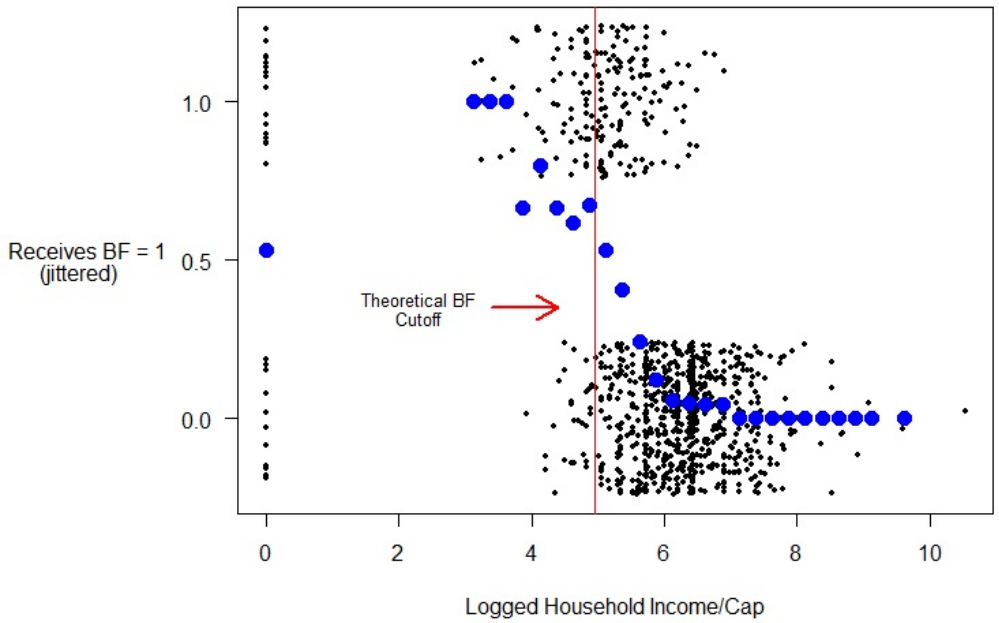
B The Non-recipient Poor Counterfactual

Do the non-recipient poor provide a fair counterfactual for the recipient poor? *Bolsa Família* is a means-tested income-based program, so theoretically a precise income threshold should separate recipients and non-recipients, raising the concern that recipients and non-recipients are somehow fundamentally different types of voters. In fact, since assignment is limited by the information available to the federal government there is considerable quasi-random noise in the assignment mechanism. Random audits of beneficiaries exist, but the government has to rely on official (formal) employment records to verify the accuracy of assignment. Recall that somewhere in the neighborhood of 43.8% of Brazilians have some informal income (Paim et al., 2011). The likelihood of having at least one source of informal income in a household tends to increase as one gets poorer and decrease as one gets wealthier. Therefore, even the type of unbiased assignment mechanism said to exist in federal *Bolsa Família* allocation (Fried, 2012), will be subject to noise in the form of measurement error from hidden income sources. Since the noise introduced by informal income ought to decrease as a household gets richer, the probability of erroneous assignment should also decrease with household wealth. Furthermore, the Program's income registration records are only updated every two years, which is a source of additional noise in assignment due to the fact that the poor have volatile incomes (Soares, Ribas and Osório, 2010).

Using the survey data described later in the "Data" section, we may examine the probability of assignment to recipient status as a function of income. In Figure 5 below, I plot the proportion of survey respondents that report receiving *Bolsa Família* income across bins of logged (pre-transfer) per capita household income. I use logged income for this visualization due to the large degree of right skewness in the income distribution in Brazil. The figure shows a probability less than one of receiving the transfer for those who fall below the official program cutoff.

The figure below (measured in original unlogged household income per capita in

Figure 5: Probability of Receiving Bolsa Familia
by Pre-Transfer Income

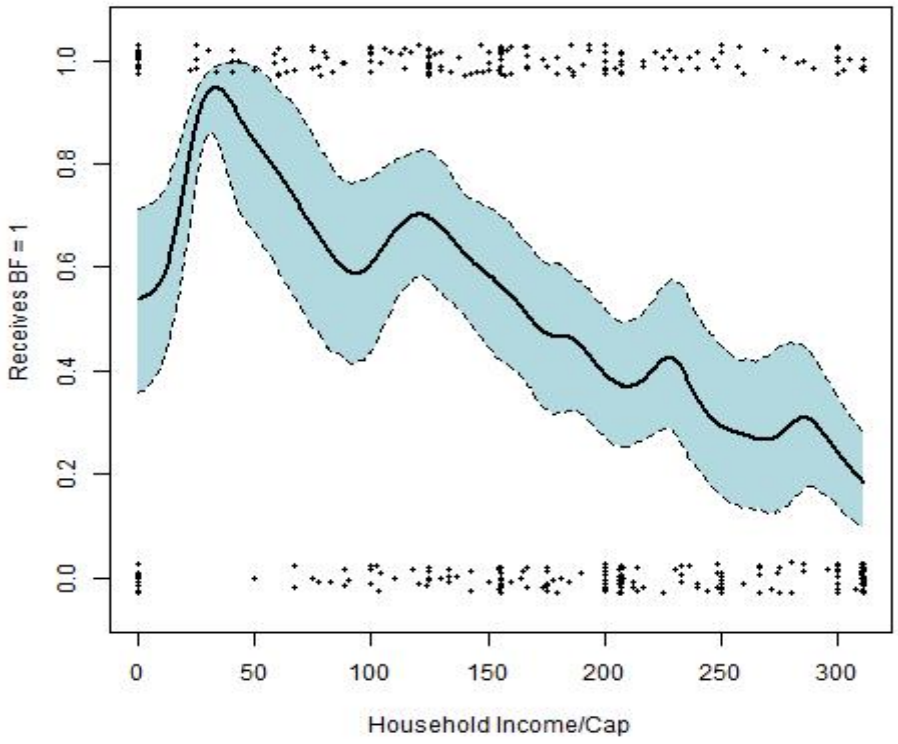


Brazilian *reais*) zooms in on the subset of the sample that I classify as "poor"—those with per capita household incomes below one-half of the monthly minimum wage. It plots the probability of assignment to recipient status for the poor as a smooth function of per capita household income. Though not perfectly monotonic, the plot indicates that assignment to recipient status is a relatively smooth decreasing function of income. The area shaded in blue is the bootstrapped 95% confidence interval.

I estimate that 56.7% of the poor constituency in the sampling frame receives *Bolsa Família* income.[20] This is consistent with reports that *Bolsa Família* is well-targeted. The World Bank estimates that 94% of recipients are among the poorest 40% of the population (based on all income sources) (Lindert et al., 2007). This is a good targeting outcome,

[20]I calculate the probability of receiving *Bolsa Família* given one's income nonparametrically, using a normal kernel density smoother with the optimal bandwidth suggested by Scott (Scott, 1992). I then compute the predicted probability of assignment for each observation (given income level) in the poor constituency. I use these predicted probabilities for each observation to compute an expected probability of receiving *Bolsa Família* for the whole poor constituency in the sampling frame by computing the inverse-probability-weighted average of these predicted values.

Figure 6: $\Pr\Big(\text{Recipient}\Big|\text{Household Income per Cap}\Big)$



but it also reflects a fair amount of noise in assignment. About 25% of Brazilians live in households that receive *Bolsa Família* income (Lindert et al., 2007). If the program were perfectly targeted without assignment noise, then 100% of recipients would be in the poorest 25% of the population. Taken together, this evidence suggests that non-recipients do provide a good counterfactual for recipients, so long as one controls for a continuous measure of pre-transfer household income per capita, which I do.

C Data

Survey Data

The dependent variable, vote choice, must be observed at the individual level. The main independent variables argued to condition service responsiveness, household income per capita and the family's *Bolsa Família* status, must be observed at the household level. Since by law election day ballots are cast in secret, survey data is the necessary vehicle for vote choice measurement. Survey methods are also conducive to household data-collection. I implemented a survey in the field prior to the municipal elections held in Brazil on October 7$^{\text{th}}$, 2012 to elicit intended vote choice from eligible voters. This measure is inherently noisy, since many voters still report themselves to be undecided before election day. I limited the survey period to the two weeks leading up to the elections in attempt to minimize this type of noise.

Since this is a study of individual behavior in response to mayoral strategic distribution, the sampling design had to balance two inferential objectives that were often at odds with each other: individual-level inference and municipal-level inference. Municipalities with larger populations and geographies, namely large cities, may also have more demographic variability. Population-weighted sampling across municipalities is therefore important for the purpose of capturing the full range of demographic influence on individual vote choice. However, individual dynamics in a municipality will also be driven by municipal-level factors, including municipal-level health spending, population size, and the percent of the municipal population that is poor. Thus, the population weights on within-municipality sample size should not be so disparate across municipalities as to exacerbate problems of small-area estimation for smaller municipalities. In addition to a partial-pooling estimation strategy, I also attempt to arbitrate between these concerns in the sampling design.

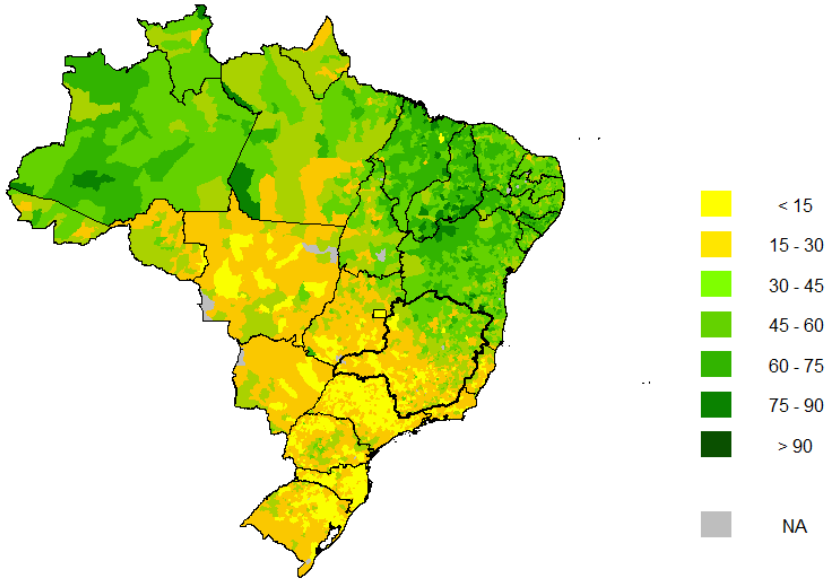
Sampling Design

The respondents were chosen via probability sample using a clustered, stratified, multistage design (see Appendix E for design summary). For reasons of feasibility, I chose to implement the survey in only one Brazilian state. Limiting the sampling pool to one state makes it possible to hold state-level factors constant while focusing on municipal dynamics. To increase the viability of out-of-sample municipal-level inference, I chose the state in which the distribution of target coverage rates for *Bolsa Família* across municipalities most closely reflects the country-wide distribution. That state is Minas Gerais (see Appendix D for a comparison of the twenty-six Brazilian states on this measure). Though no single state in Brazil is a true microcosm of the country, Minas Gerais may come the closest with respect to regional variation in development and income levels. Though Minas has a strong cultural identity of its own, the southern and western parts of the state are highly developed and culturally reminiscent of the industrial states of São Paulo, Rio de Janeiro and Goiás. In stark contrast, the northern and eastern municipalities are poorer, more rural, and seem to have more in common both culturally and economically with their northern neighbor, Bahia, than with the south of Minas Gerais.

Figure 7 shows that Minas Gerais is also the state with the most variation across municipalities in the percentage of families that qualify for *Bolsa Família* benefits. Sampling municipalities from Minas Gerais (as opposed to, say, São Paulo) helps ensure that the sample covers municipalities from the full development spectrum. Furthermore, since this paper attempts to estimate the effects of primary care spending on both the poor and the better-off, it is important that both of these groups are well-represented in the sample.

Within Minas Gerais, I conducted the sampling without replacement in four stages: municipalities, census tracts, households and individuals. The sampling frame for municipalities included all municipalities in Minas Gerais in which more than one candidate contested the mayoral election and in which one of these candidates was the incumbent

Figure 7: Percentage of Families Qualifying for *Bolsa Família* by Municipality in 2010



mayor.[21] I divided these municipalities into nine strata according to the mayor's party and the percentage of families in the municipality that qualify for *Bolsa Família* benefits or, $s \in \{PT, Coalition, Opposition\} \times \{0-25\%, 25-50\%, >50\%\}$.[22] Within strata, I sampled municipalities with probability weights proportional to the size of the municipality's eligible voter population. Appendix E provides details on the sample, including a table showing the number of municipalities sampled within each strata and a complete enumeration of sampled municipalities.

Second, within each sampled municipality, I sampled census tracts with probability weights proportional to the size of the tract's eligible voter population. The number of sampled tracts selected per municipality was proportional to the *square root* of the tract's eligible

[21]Mayors are limited by law to a single consecutive re-election. Though most mayors do attempt re-election, this frame excludes municipalities in which the incumbent is termed-out by law or is legally disqualified by the Brazilian court system.

[22]The *Partido dos Trabalhadores*, or PT, is the presidents party. If the mayor is not from the president's party, I classify his party as either in the president's national coalition (included in the Cabinet) or the opposition.

voter population (to allow for oversampling in smaller municipalities to improve municipal-level inference). Appendix E lists the number of census tracts sampled per municipality. Within the selected tracts, I sampled eight households with equal probability from a complete enumeration of domiciles assembled by the IBGE during the 2010 Census. Finally, the last stage of sampling was completed in the field. Native Brazilian-Portuguese-speaking enumerators visited the sampled domiciles and, using a random number table, sampled one respondent with equal probability from among the household's eligible voter population.

The trained enumerators then conducted face-to-face interviews with consenting respondents in order to elicit survey responses.[23] Whenever possible, the interviews were conducted without the presence of others. Enumerators returned once to the domicile if the sampled individual was not available upon first visit. Those that declined participation were replaced by a new household using the same sampling procedure. The first question asked respondents who they would vote for for mayor on October 7^{th}.[24] They were provided both a written and verbal list of local candidates, identified by both their official ballot name and number. Respondents had the option to respond verbally with the name or candidate number of their choice, or to indicate the answer by pointing. About half of the 1,199 respondents indicated they had not yet decided.

Valid survey inference from a probability sample depends on the representativeness of that survey, once accounting for the probability of being included in the sample. To evaluate the validity of inference from the survey with respect to the sampling frame described above, Appendix F compares (inverse-sampling-weighted) descriptive statistics from the survey with Census and Ministry of Social Development data for demographic variables describing the sampling frame. Appendix G plots the incumbent's predicted vote share (calculated from the pre-election survey sample) and compares this to his observed vote share on election

[23]The use of home visits enabled the participation of poor families without Internet or phone access as well as illiterate respondents.

[24]This ordering was intentional to avoid possible short-term priming effects from the topics of social assistance and health care, which came up later in the survey.

day.[25]

Public Finance Data

The municipal budget itemized expenditure data comes from the records of the National Treasury of Brazil. These records divide municipal expenditures into functions of the municipal government, such as "health." They further divide these functions into subfunctions, such as "primary care" and "hospital care." I use these two subfunctions. My measure of total health spending is the sum of the two. Averaging across municipalities, these two subfunctions account for 84% of all municipal expenditures on health, the remainder primarily being administrative and research costs of "health surveillance."

Population Measures

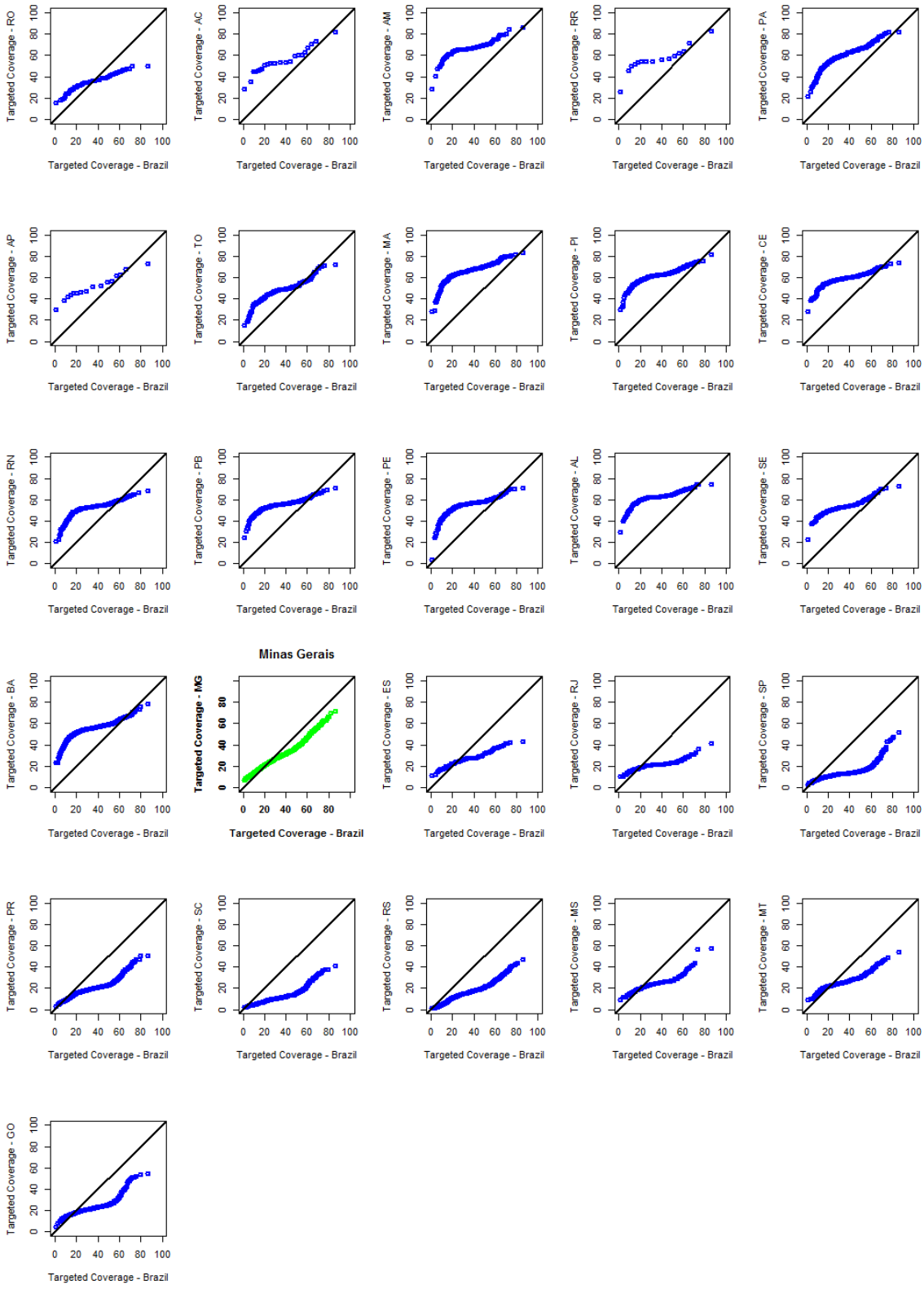
The measurements of population size and of the percentage of families in the municipality that I classify as poor come from Brazilian census data from 2010. The census data provide counts of the number of households in each municipality that earn a monthly per capita income that falls within a certain range on the minimum wage scale. Brazil has no official "poverty line," however, the cutoff of one-half of the monthly minimum wage in household per capita income is a measure commonly-used for this purpose (Lula da Silva, 2012). This measure is also judged by the IBGE to be a reasonable proxy for overall vulnerability, capturing the majority of families coping with precarious housing or sanitation conditions (Pinto de Oliveira, 2010). About 32% of all households in Brazil fall into this category according to the 2010 census data (Instituto Brasileiro de Geografia e Estatística, 2010).

[25]Note that the research design is not meant to support a fully separating analysis of the data within each of the 38 municipalities. Within-municipality sample-size ranges from a low of 16 respondents to a high of 214, dependending on municipality size.

D Selection of Minas Gerais

The "target coverage rate" for a Brazilian municipality measures the percentage of the municipal population that qualifies for *Bolsa Famílía* benefits according to estimates from Brazil's Ministry of Social Development and Welfare. Figure 8 shows quantile-quantile plots for each state in Brazil comparing the distribution of target coverage rates for all the municipalities in each state with the distribution of target coverage rates in all of Brazil. If the shape of the distribution of municipalities in a state is the same as the shape of the distribution of all municipalities in Brazil, the Q-Q plot will be a 45 ° line (included in black for reference). Of all the states, Minas Gerais comes closest to approaching this theoretical ideal.

Figure 8: Quantile-Quantile Plots of Targeted Municipal *Bolsa Família* Coverage Rates



E Sampling Design Summary

E.1 Sampling Frame

Eligible voters (i.e., citizens aged 16 years and up) in all of the census tracts in Minas Gerais that fall within municipalities in which the incumbent mayor is running for re-election and in which at least two candidates are competing for the position of mayor, excluding "special census tracts" (hospitals, military barracks, prisons, orphanages, etc).

E.2 Sampling Methodology

The sampling was implemented using a stratified, clustered multi-stage probability sampling design. The four stages are outlined below.

First Stage

In the first stage, I sampled from municipalities in which the incumbent mayor ran for re-election and in which at least two candidates competed for the position of mayor. Within municipal strata, I used sampling weights proportional to the size of the municipal population with at least 16 years of age. The municipalities are stratified on the incumbent candidate's party (either *Partido dos Trabalhadores*, Coalition, or Opposition) and the percentage of the families in the population that qualify for Bolsa Famlia benefits (either 0-25%, 25-50%, or over 50%). The sampling allocation of municipalities within strata oversamples municipalities with PT incumbents and oversamples municipalities with greater than 50% of the population qualifying for Bolsa Famlia.

Second Stage

Within sampled municipalities, I sampled census tracts with probability proportional to the size of the eligible voter population of the tract. The number of tracts sampled in each municipality is proportional to the square root of the size of the eligible voter population

Table 4: Number of Municipalities Sampled within Strata

		Mayor's Party Affiliation			
		PT	Coalition	Opposition	Total
Percent of Families Qualified for *BF*	$0-25\%$	5	4	4	13
	$25-50\%$	3	4	5	12
	$>50\%$	3	5	5	13
	Total	11	13	14	**38**

of the municipality (smaller municipalities are oversampled to deal with issues of small area inference).

Third Stage

Within sampled tracts, I sampled households with equal probability for each housing unit.

Fourth Stage

Within sampled households, enumerators sampled an individual respondent with equal probability from all eligible voters in the household.

E.3 Sample Size

A sample of 1199 respondents were interviewed from 146 census tracts. The initial sample included 150 census tracts (aiming for 1,200 respondents—eight from each tract). However, I dropped one municipality from the sample shortly before enumeration began when the incumbent mayor was disqualified from the election by the Brazilian court system. I therefore instructed enumerators that visited the northeast of Minas Gerais to oversample from their census tracts to compensate and this alteration was included in the calculation of the inverse sampling weights.

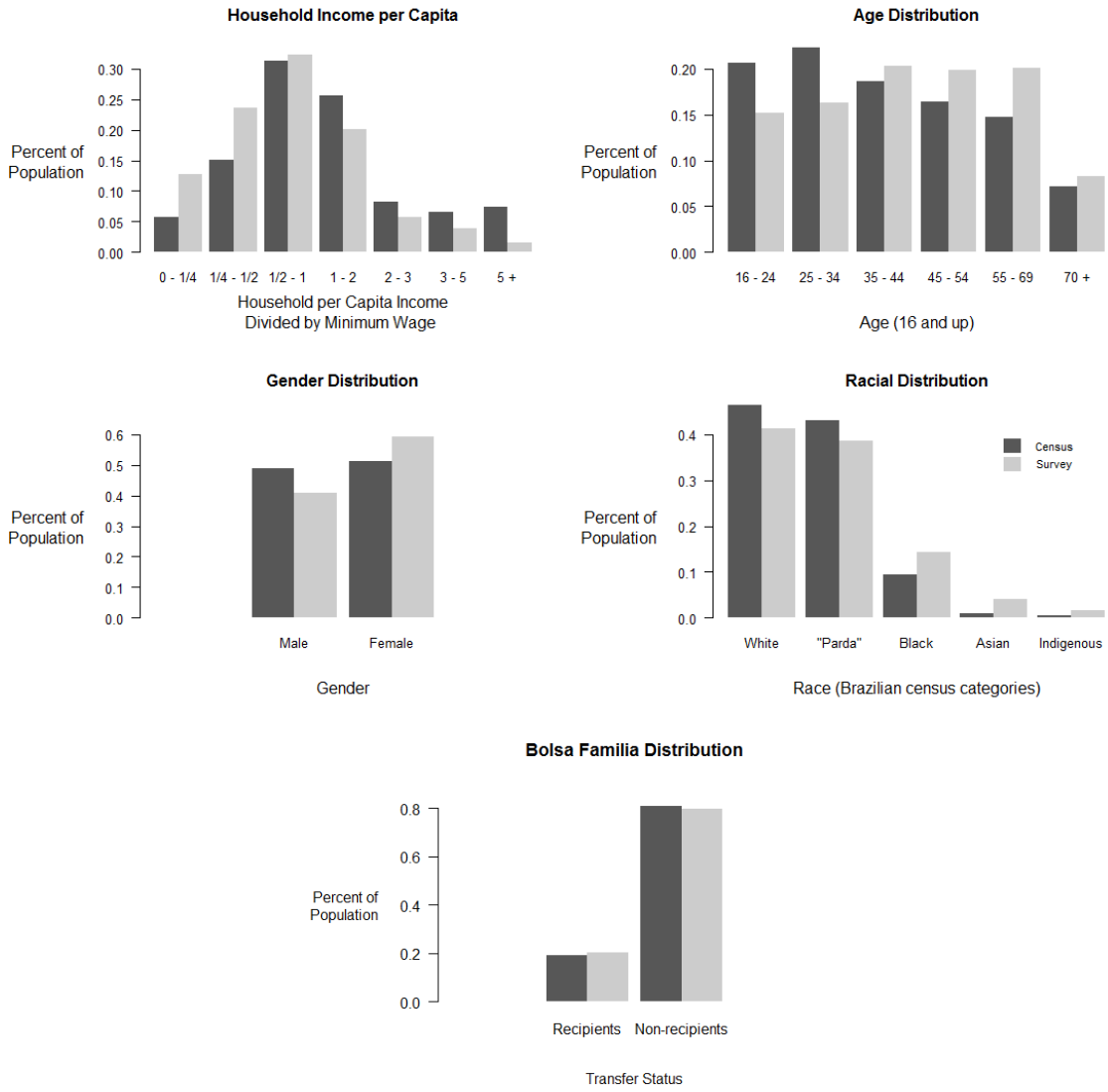
E.4 Sampled Municipalities

Municipality	Census Tracts Awarded (Total = 146)
AGUAS VERMELHAS	2
ARAGUARI	5
BELO HORIZONTE	26
BELO ORIENTE	2
BETIM	10
CARAI	2
CARANGOLA	3
CARVALHOS	2
CATAGUASES	4
CONEGO MARINHO	2
COROACI	2
DONA EUSEBIA	2
ESMERALDAS	4
GOVERNADOR VALADARES	8
IBIAI	2
IBIRACATU	2
ICARAI DE MINAS	2
INDAIABIRA	2
INHAPIM	2
ITAIPE	2
JACINTO	2
JANAUBA	4
JEQUITAI	2
JUIZ DE FORA	12
MATIPO	2
MONTE FORMOSO	2
MUTUM	2
PAVAO	2
PEDRAS DE MARIA DA CRUZ	2
PIRAUBA	2
POUSO ALEGRE	6
SAO GOTARDO	3
SAO JOAO DA LAGOA	2
SAO JOSE DE JACURI	2
SAO SEBASTIAO DO RIO PRETO	2
URUCUIA	2
VARGINHA	6
VESPASIANO	5

Figure 9: Map of Sampled Municipalities in Minas Gerais

F Descriptive Statistics

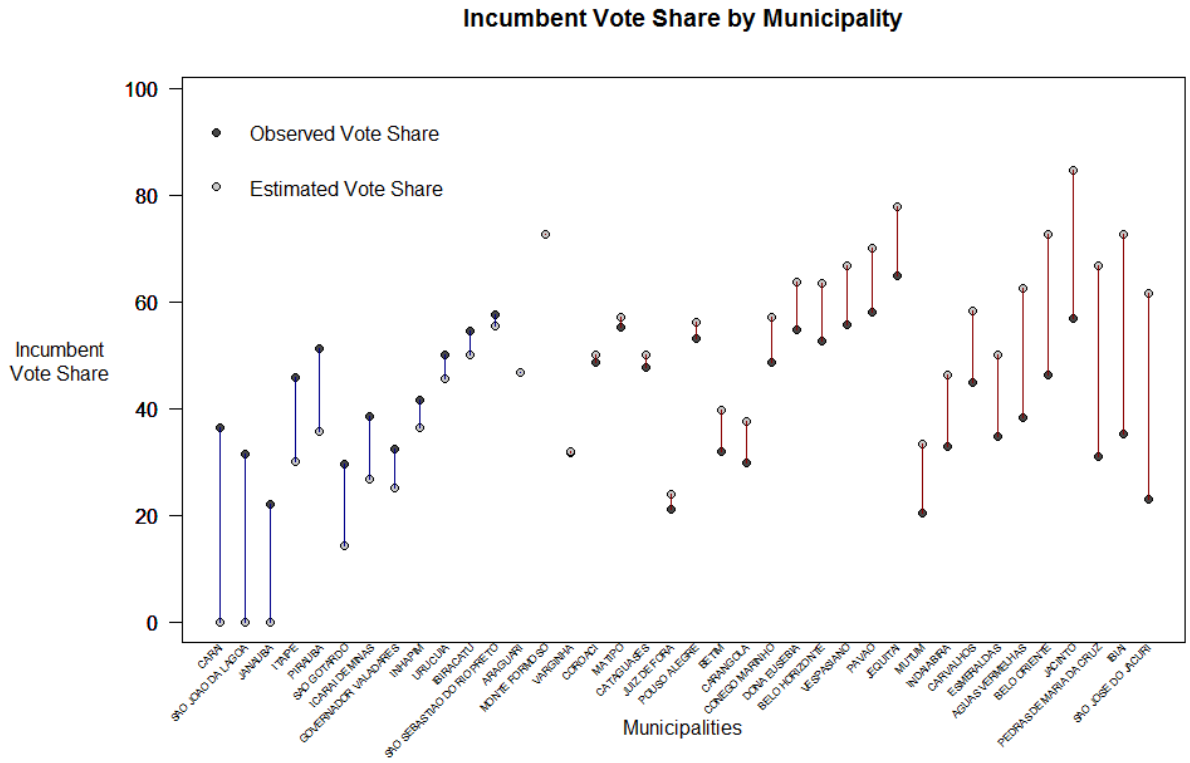
Figure 10: Comparing Survey Estimates with Census Data for Sampling Frame



Note: The survey data are weighted by inverse sampling weights. I have excluded those that declined to respond to the survey question. This includes 24% of survey responses for income and under 3% of survey responses for race. The other categories pictured had complete response data.

G Vote Share Descriptive Statistics

Figure 11: Comparing Survey Estimates with Election Outcome



Note: Blue lines show the distance between the predicted and observed incumbent vote shares where the prediction underestimated the outcome; red lines show the size of overestimates.

H Non-EM Hierarchical Results

Table 5: Non-EM Hierarchical Probit Results

Variable	Coef
Underlying Propensity to Favor Incumbent	
$\alpha^{\{p\overline{R}\}}$ (Intercept: Poor Non-Recipient)	0.175 0.943 (2.455)
$\alpha^{\{pR\}}$ (Intercept Shift: Recipient)	0.026 0.923 (0.270)
$\alpha^{\{w\}}$ (Intercept Shift: Better-off)	0.540** 0.027 (0.245)
Responsiveness to Primary Care Spending	
$\gamma^{\{p\overline{R}\}}$ (Poor Non-Recipient)	0.001 0.777 (0.003)
$\gamma^{\{pR\}}$ (Poor Recipient)	-0.005** 0.011 (0.002)
$\gamma^{\{w\}}$ (Better-off)	-0.003** 0.024 (0.001)
Responsiveness to Hospital Spending	
ψ Change in Total Health Spending/Cap	0.004 0.371 (0.004)
Health Expenditure Context	
λ_1 Total Health Spending/Cap 2011	-0.001 0.735 (0.002)
λ_2 Primary Care Spending/Poor Head 2011	0.001** 0.044 (0.0004)
Municipal Vote Predictors	
λ_3 Municipal Population (Logged)	-0.076 0.650 (0.166)
λ_4 Percent of Pop Classified as Poor	0.007 0.653 (0.016)
λ_5 Dummy for State Capital	0.846 0.327 (0.863)

Continues

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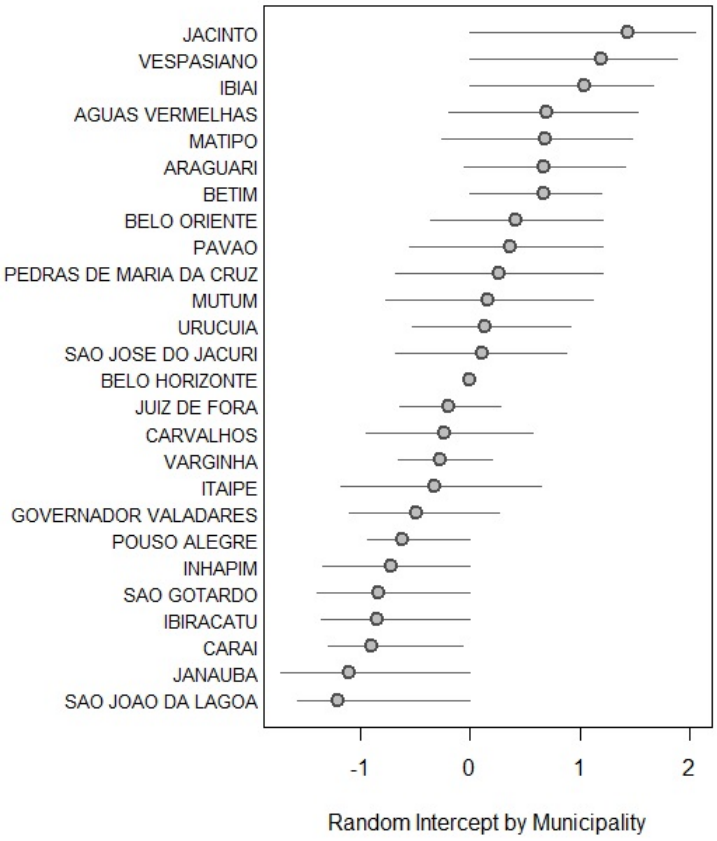
Variable	Coef
Individual Vote Predictors	
λ_6 Co-Partisan with Mayor	1.840***
	0.000
	(0.288)
λ_7 Household Income/Cap (Logged)	-0.213**
	0.023
	(0.094)
λ_8 Age	0.011**
	0.017
	(0.005)
λ_9 Female	0.260*
	0.073
	(0.260)

Note: Reported values include the estimate, p-value, and standard error. The ***,**, and * notation denotes statistical significance for a two-tailed t-test (0.01, 0.05, and 0.10 α levels, respectively). The model includes 399 observations with complete data. The standard deviation of the random intercept is estimated to be 0.452.

I Random Intercept Components

Figure 12: Underlying Popularity of Incumbent Mayor



Note that the line segments are bootstrapped 95% confidence intervals. Also note that Belo Horizonte appears as the baseline because I have modeled its deviation from the grand mean as a fixed effect, since it received notably more national attention than any of the other sampled municipalities.