

# Political Patronage and Local Development: A Brazilian Case Study

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## **Abstract**

This paper investigates how political incentives affect the allocation of public investments using data from Brazil's Chamber of Deputies. Federal deputies can submit budgetary amendments for public works in their state's municipalities. Our results show that federal deputies reward municipalities based on political support. A 10 percentage point increase in vote shares received in the previous election implies an expected increase of R\$75,174 in public works for a municipality during the electoral cycle. Political motivations also influence the type of public work the municipality receives, even conditioning on its local needs. Because these public goods vary in their degree of exclusion, politicians prefer to allocate goods that less excludable to municipalities where they received more political support. With the allocation of public investments manipulated to meet political objectives, we examine the impact of these public works on local welfare. We show that public investment while increasing average per capita income, also increased local income inequality.

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# 1 Introduction

For Brazil's highly unequal society, the transition to democracy has unfortunately had little effect on its political and social inequalities. Explanations for the lack of any substantial redistributive reform have primarily focused on Brazil's persistent clientelism and political patronage ((Engerman and Sokoloff 2002);(Weyland 1996); (Mainwaring 2002); (Ames 1995)). Yet despite the attention patronage has received among Brazilian scholars, the extent to which it influences public spending and contributes to inequality remain relatively unexplored empirical questions. This study examines data on budgetary amendments from Brazil's Chamber of Deputies to test for the existence of patronage in both the provision and type of public works projects allocated to municipalities. Because patronage may divert public goods from a need-based allocation, we also explore the impact of these public investments on local inequality and welfare.

Brazil's Chamber of Deputies provides an ideal setting to analyze these issues of patronage. The Constitution permits each federal deputy 20 budgetary amendments to fund public good projects to municipalities. This provision allows us to investigate what factors influence where the deputy allocates the public good, what type of good, and the amount. These federal outlays specify large-scale development projects that are intended to have important economic consequences. Understanding the effects of these public investments on local welfare may provide insights into how political incentives affect local development.

The focus of this paper is two-fold. First, we estimate whether a federal deputy's electoral support in the 1994 election affected the allocation of his 1996-1999 budget amendments. Second, with potential social and economic inefficiencies in the distribution of these public works, we explore the extent to which federal outlays affect local welfare. In particular, we estimate the impact of federal outlays on average per capita income and income inequality of the municipality.

The first part of the paper documents political patronage in the allocation of these public works projects. Our estimation exploits the fact that each state is an at-large multimember district to control for any omitted deputy-invariant municipality characteristics, as well as any omitted municipality-invariant deputy's characteristics. We show that the degree of electoral support affects not only the probability that a deputy executes a public investment in a municipality, but also the size and type of project. The effects are quite pronounced; on average, a 10 percentage point increase in electoral support will increase the probability that a deputy will reward

a municipality by 32.8 percent. Moreover, this increase in electoral support also translates into an increase of the amount of the project by 4.31 percent. Together these estimates imply a reward of R\$75,174 per electoral cycle. These results are also consistent with an adaptation of the theoretical models proposed by (Stromberg 2003) and (Dixit and Londregan 1996).

Our theoretical framework, and its empirical test, contributes to the class of "core-supporter" models, which argue that politicians seeking to maximize the political return to public investments, target federal projects and programs to loyal constituents ((Cox and McCubbins 1986); (Dixit and Londregan 1996)). Empirical support for these models is however somewhat mixed. Using U.S. intergovernmental transfers from 1957 to 1997, Ansolabehere and Jr. (2003) show that the State's governing party allocates funds to areas that provided them with the strongest electoral support. Case (2001) also finds support for the core supporter model in the manner in which block grants of an Albanian social assistance program were distributed across communities. Recent work by Miguel and Zaidi (2003) in Ghana found that administrative district where the ruling party won all parliamentary seats in the 1996 elections received 27 percent more school funding in 1998-99. Schady (2000) also finds evidence that Fujimorian supporters were disproportionately favored in the allocation of the Peruvian Social Fund (FONCODES).

There is however, support for an alternative model: politicians will distribute funds to pivotal or swing-voters ((Lindbeck and Weibull 1987); (Dixit and Londregan 1996); (Persson and Tabellini 2000)). Looking at the distribution of ecological grants across municipalities in Sweden prior to the 1998 elections, Dahlberg and Johansson (1999) find that the more swing voters at the cutoff points the higher the probability a municipality will receive the grants. Wright (1974), in this seminal article, showed the distribution of New Deal spending was also skewed towards swing states, as measured by the variability of vote shares. Finally, Magaloni, Estvez, and Diaz-Cayeros (2000) find evidence from the distribution of Mexico's PRONASOL program that supports both the swing voter and core-supporter theory.

While the empirical literature has been careful to distinguish to whom public goods are allocated, and to some extent how much, much less attention has been given to the type of goods that politicians provide to garner political support. Insights into this question, which have mostly been provided by theoretical studies, suggest that politicians prefer excludable goods that can be narrowly targeted (Scott (1972); Bates (1981), Cox and McCubbins (1986)). As a result, several studies focus on public employment as the primary instrument of machine politics. Persson and Tabellini (1999), for

example, show that public goods will be under-provided because of the inability to finely target them. Robinson and Verdier (2001) extend this idea to show that to solve the double commitment problem implicit in campaign promises, politicians offer public employment even though economic inefficiency results in the process.

Although the patronage we examine involves the distribution of public works projects, our results are still consistent with this basic intuition. We find that projects that are less excludable, such as construction of a hospital or other aspects of health care, tend to be allocated to municipalities that offer higher degrees of electoral support. Conversely, more particularistic items such as equipment for a technical school are targeted to municipalities defined by lower vote shares.

With the potential inefficiency implied in the distribution of these public investments, the remainder of the paper examines the impact of these federal transfers on local welfare. More explicitly, we estimate the effects of these public investments on average per capita income and income inequality in a municipality. To address the potential bias stemming from omitted variables, we exploit the fact that politicians reward political support with federal outlays. This political behavior along with the "quasi-random" event that some politicians became deputies as alternates represents the mechanism and exogeneity assumption of our proposed instrument. The IV approach estimates an income-federal expenditure elasticity of 0.071, which is 7 times the OLS estimates. The increase in per capita income however, comes at the cost of higher income inequality, as measured by a Gini-expenditure elasticity of 0.046. The increase of inequality is also irrespective of the type of public expenditure; public works in the areas of health, infrastructure, and education have had a regressive effect on income inequality.

The returns to these public investment both in terms of income and inequality depend crucially on local context. The regressive impacts on inequality are much more pronounced in municipalities with low levels of political competition or high land concentration, whereas income effects are higher among municipalities with a civil defense. Social councils, which were established during Brazil's decentralization and designed to provide oversight on various areas of local public expenditure, also influence the returns to these public investments. Municipalities with a high proportion of social councils that have deliberative powers experience both a higher income effect and relatively lower regressive effects.

These findings, consistent with aggregate figures reported in (de Ferranti et al. 2003), suggest that redistributive social spending, though perhaps necessary, is not sufficient to reduce social inequalities as long as political

inequalities exist. The case of Brazil demonstrates that even the provision of public goods, generally regarded as progressive in terms of inequality, can have adverse consequences if the effects of political incentives are not taken into consideration. In order for redistributive policy to be effective at the national level, further research is needed to understand how local institutions determine the allocation of these public goods at the local level.

Section 2 of this paper describes the institutional background to the Chamber of Deputies. Section 3 presents a simple theoretical model to describe how an incumbent deputy might allocate public works across municipalities. The model demonstrates an incentive to provide federal outlays to municipalities with more core supporters. This theoretical model defines our empirical strategy in section 4. Section 5 describes the data sources used and provides some basic descriptive statistics of these data. In section 6, we present both our evidence on political patronage and the impact of these federal transfers on local welfare. Section 7 concludes the paper.

## **2 Institutional Setting**

Several features of Brazil's political institutions, both formal and informal, facilitate our empirical analysis of political patronage. This section provides basic background on the Chamber of Deputies, and highlights some of its institutional features that we later exploit in our analysis. Our results are best understood recognizing a context where patronage has been a salient feature throughout its political history. This is illustrated in some of the previous studies that this section presents below.

### **2.1 The Chambers of Deputies**

The Chamber of Deputies consists of 513 seats allocated across 27 states according to population size (see Table 1). Each state represents a single multimember voting district, where candidates can in principle receive votes from any of its municipalities. As to be discussed below, several incumbents representing a single state allows for an estimation approach that can eliminate a class of potential confounding factors.

Nationwide elections for the legislature are held on a four-year cycle and incumbents can be elected an unlimited number of times. Despite the lack of any term limits, legislative careerism is surprisingly absent in Brazil. In 1994, the percentage of deputies who sought reelection was 78.7 percent (Samuels 2003). Moreover, several elected deputies either take a leave of

absence or resign in order to assume another political position in the municipal, state, or national government. When this occurs, a candidate who had been elected as an alternate (*suplente*), then assumes the office. Surprisingly, the number of *suplentes* needed to serve office is not insignificant. Of the politicians that served the 49th parliamentary session, at least 25 percent of them were non-elected deputies.

The D'hondt open-list proportional representation method determines how many seats in a state each political party earns, while voters' preference select the individual candidates within each party. Although the electorate can vote for the political party, this option is rarely exercised as elections tend to be highly individualized. This electoral system, which fosters both inter and intra-party competition, has been a source of Brazil's weak party system (Mainwaring and Scully 1995). It is not unusual for several elected officials to change parties during their electoral terms. In the 49th parliamentary session 55 percent of the deputies switched parties during their term. With a low degree of party loyalty both from the standpoint of the politician as well as the electorate, our empirical analysis does not focus on party politics but instead on the individual behavior of federal deputies.

Several aspects of Brazil's political institutions promote pork-barrel politics. Brazil's legislature is comparatively weak and seldom legislates on issues of national concern (Ames 1995). While refraining from serious policy making, federal deputies engage in pork-barrel politics. As a Federal Deputy from Ceará stated in the Brazilian newspaper, *Folha de São Paulo*, on February 21, 1988: "A political career in Brazil is closely connected to success in bringing home material benefits...Especially in the poorest regions, communities judge their deputies on what they bring home"; or Federal Deputy Joaquim Haickel expressed: "The primary function of a deputy is getting resources; legislating comes second." (Mainwaring 2002). To facilitate these objectives, federal deputy have had the right to submit pork-barrel amendments to the budget since 1988. Before 1996, members of Congress were not limited in the number budgetary proposal and between 1992 and 1995 averaged close to 137 per year per member. In its current form, Brazil's constitution allows each member of Congress discretion over 20 budgetary amendments per year, totalling to a fixed amount typically of R\$2 million, although this amount can vary by year. In total, these amendments represent a significant proportion the federal government investment in public goods.

## 2.2 Distributive Politics

In his seminal work, Bates (1981) writes: "In their efforts to organize political support in the countryside, African governments also manipulate the structure and performance of their public services. Governments everywhere supply roads, clinics, schools, water supplies, and the like. In Africa, and in other developing nations, "development" projects are also standard fare. And whether it be in Mayor Daley's Chicago or Awolow's Western Region of Nigeria, the supply of such services can be, and is tailored to the quest for political support."

Brazil is no exception. With its long tradition of clientelistic practices and patronage, the political use of public resources has been well documented among several Brazilian scholars. Graham (1990) for example, finds that during the nineteenth century, political leaders regularly used appointments to reward the party faithful after the elections. In the analysis of 600 private letters of recommendation written on behalf of office seekers during 1880's he goes on to write: "Politics took form and the transaction of power occurred through this kind of correspondence - outside the institutional framework. The most frequent letter writers were members of Parliament, who wrote to Cabinet members on behalf of others. Writing such letters was one of a Deputy's central activities." Analyzing budgetary amendments a century later, Ames (1995) asserts "deputies submit amendments to benefit localities where they seek to reward allies and recruit new supporters." In this classic study, he argues that Brazil's electoral system of open-list proportion representation tends to promote individualistic politics and thus higher rewards for pork barrel behavior. Although few scholars dispute that federal deputies engage in pork-barrel behavior, Samuels (2003) recently contends its effect on incumbency reelection. He argues that deputies use patronage politics to garner support for other state and municipal political positions rather than a career in the legislature.

Even in the examination of Porto Alegre's move towards participatory budgeting in Brazil, Abers (2000) describes the distortions that political patronage creates: "Today, many local politicians continue to mobilize electoral support both for themselves and for their allies at the state and federal levels through complex systems of patronage, distributing state resources on a particularistic, personal basis. Not only does this system tend to concentrate power in the hand of incumbents who have access to state resources, but the highly discretionary nature of public resource allocation under clientelism also inhibits systematic planning and the implementation of generalized, egalitarian social policies."

It is within this context, that Brazil provides an ideal laboratory in which to explore issues of political patronage, and its consequences for local development.

### 3 Theoretical Framework

In this section, we present a simple model inspired by Stromberg (2003) and Dixit and Londregan (1996) to help motivate our empirical specification.

Consider an incumbent federal deputy  $i$  in a given state, who can allocate per capita budgetary amendments  $f_{i,m}$  across municipalities  $m$  subject to the following budget constraint,

$$\sum_m N_m f_{i,m} = \bar{F} \quad (1)$$

where  $\bar{F}$  is the maximum amount that a deputy can disperse during his electoral term and  $N_m$  is the population of municipality  $m$ .

The deputy understands that a voter  $k$  in a municipality derives utility from these budgetary amendments according to the following expression,

$$v(f_{i,m}) = \frac{\exp^{\alpha_m + \beta x_m + \xi_i}}{1 - \epsilon} (\theta_{i,m} f_{i,m})^{1-\epsilon}.$$

The parameter  $\epsilon$ , which we assume to be positive, measures voters' responsiveness to additional transfers: for  $\epsilon$  small, marginal utility diminishes relatively slower as income increases. The expression  $\exp^{\alpha_m + \beta x_m + \xi_i}$  represents a set of taste shifters which reflect the fact that municipalities may value budgetary amendments differently based on their own characteristics,  $\alpha_m + \beta x_m$ , and the characteristics of the incumbent,  $\xi_i$ . Following Dixit and Londregan (1996), we interpret the parameter  $\theta_{i,m}$ , which we assume lies between 0 and 1, as the efficiency at which the federal transfers can be targeted. A deputy with a high  $\theta_{i,m}$  in a given municipality, has a higher proportion of core supporters, and thus by assumption can deliver public works much more effectively.

In addition to the economic benefits from federal transfers, voters possess an ideological preference,  $\eta_{i,m}$ , in favor of the incumbent  $i$ . In effect, an individual's total utility in municipality  $m$  consists of a trade off between economic benefits and ideology when deciding to vote,

$$W(f_{i,m}; \alpha_m, \beta, \theta_{i,m}, \epsilon, \xi_i, \eta_i) = v(f_{i,m}) - \eta_{k,i,m}$$



Citizens then vote according to a rule  $r$  which requires that an incumbent meet a minimum requirement  $\bar{v}$  in order to receive support, otherwise the vote is for a challenger, i.e.

$$r = \begin{cases} 1 & \text{if } W(f_{i,m}; \alpha_m, \beta, \theta_{i,m}, \epsilon, \xi_i, \eta_i) > \bar{v}_{k,i,m}, \\ 0 & \text{otherwise} \end{cases}$$

Although uncertain about the voters' preferences, the incumbent correctly realizes that  $\eta_{k,i,m} + \bar{v}_{k,i,m}$  is uniformly distributed with mean  $\mu_{i,m}$  and density  $\phi_m$ , and maximize his total vote share accordingly,

$$\begin{aligned} \text{Max}_{f_{i,1}, \dots, f_{i,M}} \sum_m N_m Pr(v(f_{i,m}) > \eta_{k,i,m} + \bar{v}_{k,i,m}) \\ \text{s.t. } \sum_m N_m f_{i,m} = \bar{F} \end{aligned}$$

Given our distributional assumptions, the constrained maximization problem can be rewritten as follows,

$$\begin{aligned} \text{Max}_{f_{i,1}, \dots, f_{i,M}} \sum_m N_m \phi_m (v(f_{i,m}) - \mu_m) \\ \text{s.t. } \sum_m N_m f_{i,m} = \bar{F} \end{aligned}$$

Along with equation 1, the Nash equilibrium to this problem yields the following set of first-order conditions,

$$\phi_m v'_m \exp^{\alpha_m + \beta x_m + \xi_i} \theta_{i,m} = \lambda \text{ for all } m = 1, \dots, M \quad (2)$$

where  $\lambda$  is the shadow price of increasing the maximum amount of federal money an incumbent can allocate across municipalities.

Before turning to the estimation equation, consider a simple comparative static result. Our first-order conditions imply that for  $j \neq m$

$$\frac{v'_j}{v'_m} = \frac{\phi_m \theta_{i,m}}{\phi_j \theta_{i,j}}. \quad (3)$$

According to equation 3, a deputy will equate the marginal benefits of federal transfers across municipalities, with the proportion of core supporters and the density of swing voters determining the marginal rate of substitution between these municipalities. Notice that given a concave utility function, and everything else held constant, the politician will allocate more transfers to municipalities with a higher proportion of core supporters, as captured by the parameter  $\theta_{i,m}$ .

## 4 Estimation Specification

In the previous section, we presented a simple theoretical framework to provide a basic intuition for how budgetary amendments might be allocated. The model suggests that federal deputies have an incentive to target the municipalities where they have a relatively higher share of core supporters. With a few assumptions, this model directly implies a simple estimation equation in which to test this association between the distribution of federal outlays and electoral support. This section presents this econometric specification and discusses the assumptions needed to credibly estimate the effect of political support on the allocation of public works.

Recall from equation 2, that our functional form assumptions imply the following first-order condition,

$$\phi_m \theta_{i,m}^{1-\epsilon} f_{i,m}^{-\epsilon} \exp^{\alpha_m + \beta x_m + \xi_i} = \lambda$$

Taking logs and rearranging, we can rewrite this equation as follows,

$$\log f_{i,m} = \frac{1-\epsilon}{\epsilon} \log \theta_{i,m} + \frac{1}{\epsilon} (x_m + \alpha_m + \phi_m) + \frac{1}{\epsilon} \xi_i - \frac{1}{\epsilon} \log \lambda \quad (4)$$

Considering our functional form assumptions, the equation above implies a positive association between federal outlays and political support when the parameter of relative risk aversion,  $\epsilon$ , across communities is less than 1. Beyond this threshold, the model predicts a negative association between political support and federal transfers.

Estimation of equation 4 illustrates several of the identification problems that have plagued much of the previous literature. As specified in the model, both municipality and candidate characteristics affect the amount of transfers a municipality receives. To omit any of these characteristics, which are likely to be correlated with a candidate's degree of political support, will clearly bias the estimated impact. Take for example, the variable  $\phi_m$ , which we introduced as the density of voters in a municipality that are indifferent between candidates. Because of Brazil's proportional-representation electoral system and its recent experiment with democracy, the swing voter concept is harder to measure.<sup>2</sup> The inability to control for the density of swing voters in a municipality is likely to bias downward the estimated effect of political support on federal outlays.

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<sup>2</sup>A common measure used to capture the degree swing voters has been the variance in electoral outcomes for a particular party over previous elections. Dahlberg and Johansson (1999) explicitly estimate the density of swing voters using voters' survey in municipalities in Sweden

In addition to unobserved municipal characteristics, personal characteristics of the candidate,  $\xi_i$ , may also bias our estimates. In a politic culture that rewards charisma as much as ideology, the inability to control for a candidate’s personal appeal may upwardly bias the effect of political support.

To avoid these econometric concerns, we exploit a unique feature of Brazil’s electoral system which designates the entire state as a single multi-party district. This feature allows an incumbent to receive support and reward several municipalities within the state. With multiple elected deputies representing any one municipality in their state, we can employ both municipal-level and deputy level fixed-effects, which should significantly reduce any omitted variable bias. These data allows for the following econometric model:

$$\log f_{i,m} = \tau + \chi \log \theta_{i,m} + \gamma_m + \zeta_i + \varepsilon_{i,m} \quad (5)$$

where  $\tau = -\frac{1}{\epsilon}\lambda$ ,  $\gamma_m = \frac{1}{\epsilon}(x_m + \alpha_m + \phi_m)$ ,  $\zeta_i = \frac{1}{\epsilon}\xi_i$ , and  $\chi = \frac{1-\epsilon}{\epsilon}$ . We interpret the stochastic term  $\varepsilon_{i,m}$  as either approximation errors of the model or municipality-deputy specific characteristics that potentially influence the amount of federal outlays, but are unobserved to the econometrician.

It is worth emphasizing that a causal interpretation of the parameter  $\chi$  depends critically on the assumption that  $E[\varepsilon_{i,m}|\theta, \gamma, \zeta] = 0$ . Municipal intercepts control for omitted municipality characteristics that are constant across deputies. And similarly, deputy fixed-effects eliminate incumbent factors that are invariant across municipalities. These fixed-effects, while greatly reducing the potential for omitted-variable bias, do not control for characteristics that are specific to both the deputy and the municipality. Although this assumption is impossible to test, we present various robustness checks to explore the extent to which omitted deputy-municipality characteristics drive our results.

## 5 Data Sources

To implement our evaluation strategy, we assemble an extensive database of political and municipal characteristics for all of Brazil from the period 1996 to 2000. This unique collection of secondary data allows for a much more complete evaluation of political patronage than previously explored in Brazil. In this section, we describe the data used in this study.

### 5.1 Data Construction

The data used for this study combines secondary data from four sources.

To investigate patronage flows, we collected federal outlay data from the Federal Chamber of Deputies and the Senate. Information on the author's name, the amount and type of public investment, and the recipient municipality is provided for each budgetary amendment issued from 1992 to 2003. Since our focus is limited to one 4-year electoral cycle, we only consider the outlays issued from 1996 to 1999.

Using the authors' names, these data are merged with the characteristics and electoral results of each politician. Election data for 1994 are available from the Tribunal Superior Eleitoral (TSE) in electronic form. These data contain vote total for each candidate by municipality, along with various individual characteristics: including, gender, education, occupation, and party affiliation. We use this information to construct our primary variable of interest, municipal vote share, as well as various other measures of electoral performance and competition. Our use of the share of votes received in the previous election as a measure of an incumbent's political support is not original. Case (2001) and Dahlberg and Johansson (1999), among others, use this exact measure of political support. We do however, try several other variables to capture political support (such as, a candidate's rank in the municipality, the difference between the top two vote-getters, and votes shares in a municipality weighted by the candidate's share of votes) and find similar results.

Two other data sources, obtained from the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística (IBGE)), complement our political variables. The richness of these data allows us to control for several municipal characteristics, whose absence would otherwise confound our estimates of the effects of federal outlays on local welfare.

For this second part of the analysis, our outcome variable, per capita income, was obtained from the 2000 population census. Per capita income is simply measured as total household income divided by household size. Using sampling weights, we then constructed for each municipality average per capita income and a Gini coefficient.

Our focus on municipalities as opposed to states has limited some aspects of our analysis. Ideally, we would like to estimate the impact of federal outlays on growth rates rather than the level of per capita income.<sup>3</sup> However, the only source of economic data at the municipality-level is the decennial population census, which creates a set of other data problems.<sup>4</sup> We recog-

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<sup>3</sup>Levitt and Poterba (1999) explore the effects of congressional representation on state growth rates in the U.S. Given the U.S. political structure and the availability of reliable data, focusing on states rather than districts seems more appropriate.

<sup>4</sup>Because several municipalities were created after 1990, calculating the change in in-

nize that the use of levels allows for several difficult to measure factors to confound our estimates, but we try to address any potential omitted variable bias in our estimation below.

Our second complementary data source from IBGE is a municipality survey, *Perfil dos Municípios Brasileiros: Gestão Pública*, conducted in 1999. These data characterize a municipality's political institutions, as well as its economic and social organization. This survey provides us with important controls for our estimation equations.

## 5.2 Estimation Sample

Although there are only 513 seats in the Chamber of Deputies, our estimation sample consists of the 616 politicians that issued a federal outlay as a deputy during the 1996-1999 legislative term. These 103 non-elected deputies were originally voted as alternates, but later replaced an elected deputy who was unable to fulfill its responsibilities. Elected deputies relinquish their post for a variety of reasons, but typically it is to assume a political position elsewhere. Inclusion of these deputies does not have any significant effect on our estimation results, as we will show below.

Table 2 presents some basic information on the outlays issued by federal deputies in our estimation sample. On average, 15 outlays are executed per year, with an approximate value of \$1.3 million reais<sup>5</sup>. Both the number and the amount decline slightly over the electoral cycle, although differences across years are not large.

Table 3 relates the allocation of these public investments to simple voting patterns. It compares various indicators of electoral performance between municipalities where a federal deputy issued an outlay and those where he did not. The differences in the means of these electoral performance indicators are striking. For example, there is 15 percentage point difference in the average vote share a deputy receives in the municipalities where he issues an outlay versus the municipalities where he does not. The other indicators, such as the candidate's ranking in the municipality, or his share of votes in the municipality weighted by the total number of votes he received, all reveal the same pattern. In effect, Table 3 provides preliminary evidence in

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come would imply losing almost 25 percent of the sample. There also appears to be some measurement error issues associated with the 1991 census.

<sup>5</sup>As mentioned previously, federal deputies were allowed up to 20 outlays totalling up to 1.5 million per year. The limits are in general reached however in our estimation we only consider outlays targeted to municipality and exclude the ones that are designed to benefit either the state or the country as a whole.

support of the political patronage hypothesis.

Figure 1 examines this relationship more closely by comparing the cumulative distribution function of municipal vote shares between outlays and non-outlays. The message of Table 3 is reinforced: for the average deputy, vote shares among municipalities that have received a public investment first-order stochastically dominate those that did not. Taken together, Figure 1 and Table 3 suggest a strong association between vote shares and budgetary amendment. The next section investigates the robustness of this relationship.

## 6 Empirical Results

This section presents the results from our analysis. First, we investigate the relationship between where deputies allocate their budgetary amendments and where they received political support in the previous election. Our findings provide evidence of political patronage, consistent with our theoretical model. In effect, a deputy's share of votes in a municipality influences both the choice to reward the municipality and the size of the public work. Moreover, we investigate whether patronage flows vary according to project types, and politicians are more likely to promote projects that are harder to target narrowly in the municipalities where they received a higher share of votes. This result is consistent with some of the patron-client theories found in the political science literature.

The second part of the analysis examines the impact of these public investments on a municipality's average income per capita and inequality. Exploiting as an instrument the incentives politicians have to reward municipalities along with the fact that some alternates "quasi-randomly" become deputies, we find significant returns in these public investments. An increase in the amount of federal outlays a municipality receives increases its average per capita income, but also its income inequality.

### 6.1 Political Patronage

We begin by investigating whether federal deputies distribute federal outlays according to where they received political support. Figure 2 present the unadjusted relationship between the proportion of outlays and the average deputy vote share, along with the 95 percent pointwise confidence intervals.<sup>6</sup>

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<sup>6</sup>To construct this graph, we simply computed the average of vote shares and the corresponding proportion of outlays in bins of width 0.02.

The figure shows that higher vote shares are in fact associated with a higher proportion of public investments. The probability of a deputy executing a budgetary amendment increases sharply with vote share, and is approximately 70 percent among municipalities where electoral support is higher than 50 percent. This relationship also appears concave as the marginal return to vote shares becomes small for deputies that have received at least 50 percent of the vote share.

Table 4 presents the regression counterpart to Figure 2. The estimates reported in Table 4 are from a simple linear probability model, where the dependent variable indicates whether or not a deputy issued a budgetary amendment in a given municipality during his entire electoral term. Each column reports the estimated effect of a deputy's share of votes in a municipality during the 1994 election on the probability of issuing a federal outlay.

The columns of Table 4 present this estimated impact for various specifications. Column 1 is based on a specification that controls for the year in which the outlay was issued, state dummies, and the municipality's population, and the next two columns correspond to specifications that include additional sets of controls. The final column estimates our most general model which controls for both deputy and municipality-level fixed-effects. Sample sizes and  $R^2$ 's are displayed below. The sample has been restricted to the non-missing observations of the various control variables, so as to keep its size constant across specifications; this adjustment does not affect the results.

The estimated effect of political support on the probability of issuing an outlay varies little across the various OLS specifications. While the inclusion of various municipality characteristics, in column 3, does seem to eliminate some of the omitted-variable bias, when compared to the base case the point estimate is still statistically indistinguishable. Each specification is estimated with high precision and does indicate a positive association between a deputy's decision to allocate outlays and his degree of political support. However, as discussed, without a measure of "swing voters" or any of the various other characteristics that the theoretical model implies, omitted variables bias is still a major estimation concern.

Column 4 in Table 4 reports the estimates from our fixed-effects model. Including deputy fixed-effects eliminates the bias attributed to municipality-invariant omitted factors that vary across federal deputies, while municipality fixed-effects control for the municipal omitted-factors that are invariant across deputies. As expected, the fixed-effects estimate is larger than the OLS estimates (by 7 percentage points) and statistically significant at the 99

percent level of confidence. Starting at a base of .153, the estimate implies that a 10 percentage point increase in vote shares increases the probability of a deputy rewarding the municipality by 44.1 percent. For comparison, having a shanty-town (an indicator of need) increases the probability of receiving an outlay by only 0.0032 percentage points. By any standard, the magnitude of patronage is sizable.

The results from Table 4, while suggestive of political patronage, reveal little about whether political support also determines the amount of public investment, as our theoretical framework predicts. We investigate this relationship in Table 5, which presents the results from estimating real expenditure of each federal project, expressed in logs, on the share of votes a deputy received in a municipality during the 1994 election.<sup>7</sup> The sample size reported below along with the  $R^2$ 's, reflects the fact that the estimation is conditioned on positive expenditures.

The effect of vote shares on the expenditure amount of the investment is reported for same specifications presented previously. In the base regression (column 1) we see that conditional on receiving an outlay, higher vote shares are associated with larger public investments; the OLS estimate is 0.27 and significant at the 99 percent level of confidence. While controlling for observable differences across deputies leaves the point estimate virtually unchanged, including municipal characteristics does increase the political support effect by 10 percentage points.

The estimate in Column 4 corresponds to the estimation specification (equation 5) derived from our theoretical model.<sup>8</sup> Once again, to account for deputy and municipality intercepts increases the point estimate significantly. Compared to the base case estimate in column 1, the fixed-effects estimate is 16 percentage points higher. This coefficient implies that a 10 percentage point increase in vote shares will increase expenditures by 4.52 percent.<sup>9</sup> At an average of R\$184,454.6 per public work, this translates into an increase of R\$8,278 (US\$2,761) per public investment, conditional on having issued the budgetary amendment. Given that municipalities on average receive

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<sup>7</sup>We tried various definition of our dependent variable, such as expenditure per capita, log expenditure per capita, and our results are very robust.

<sup>8</sup>The results presented in column 4 do not exactly correspond to equation 5 since vote shares enter in linearly. We opted for this specification because it fits the data slightly better. The estimated coefficient on log vote share is 0.031 with a robust standard error of 0.003. According to the model this translates to an  $\epsilon = 0.97$ , which is a measure of relative risk aversion that is consistent with other estimates in the literature.

<sup>9</sup>These results are much larger than those found for the Albanian Social Assistance Program. In a similar specification, Case (2001) estimates an effect of 0.015 on log total funds.



5.7 public works per electoral cycle, a mere 10 percentage point increase implies an increase in R\$47,664 per electoral cycle. If we also consider jointly the decisions to allocate and the amount, as in a two-tier decision model, a 10 percentage point increase in vote shares increases expenditure by 7.15 percent. Both in absolute numbers and considering the fact that these outlays represent investments in public goods, the impact of political support is large.

### **Estimation Concerns and Alternative Interpretations**

The key identification assumption for a structural interpretation is that  $E[\varepsilon_{i,m}|\theta, \gamma, \zeta] = 0$ . Unfortunately, as there is no direct test of this assumption, omitted-variable bias remains a potential concern. While employing both municipal and deputy fixed-effects eliminates many of the confounding factors that could contaminate our estimate, there may exist a specific interaction between a municipality and an incumbent that is driving our results. Here, we discuss some of the potential biases implied by alternative theories, and try to provide some indirect tests of our assumption.

#### *Intergovernmental Interactions*

A subclass of models within the "core-supporter" theory explore the interaction between local and federal governments. Dasgupta, Dhillon, and Dutta (2001), for example, incorporate within the Dixit and Londregan (1996) framework, a central government's incentive to provide intergovernmental transfers to state incumbents of the same party. They find that their model describes how per capita grants were distributed in India during 1968-1997. Empirical evidence has also been provided for a series of other countries as well.<sup>10</sup>

If budgetary amendments were allocated according to party affiliation, then it is possible that our patronage parameter is overestimated. In a simple test of this hypothesis, we include an indicator for whether the mayor and the federal deputy are in the same political party in both the decision to allocate transfers and the size of the public work (see columns 2 and 5 respectively of Table 6). In both case, being of the same party is positively associated with more and larger public works. However, including this variable has a minimal effect on the point estimates of political patronage, as the differences from the original specifications (see column 1 and 4 in Table 6) are statistically indistinguishable. This result is also consistent with

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<sup>10</sup>For a general review of this literature see Diaz-Cayeros and Magaloni (2003).

the weak cohesiveness in which political parties in Brazil have been depicted.

### *Cabos Eleitorais*

Our findings afford another interpretation, as well. Instead of measuring a patronage link between federal deputies and voters, one possibility is that we are actually capturing an implicit contract between the municipality's mayor and federal deputies. This may be particularly relevant for Brazil, where political brokers, *cabos eleitorais*, have been prominent figures throughout its history. These political bosses, who are simply local elites and/or local politicians, exploit clientelistic networks to control blocks of votes that are used as political currency during elections in exchange for state or federal patronage (Mainwaring 1999). For example in her study of state patronage in Minas Gerais during Brazil's military rule, Hagopian (1996) states "The mayor of Curvelo, Olavo de Matos, once remarked that a "mayor would not find an open door without a deputy - deputies use mayors as *cabos eleitorais*". Similarly, in a classic ethnography of a municipality in Minas Gerais during the mid-1960's, Greenfield writes: "In return for the promise of support from men like Dr. Santos [Mayor of Capela Nova], the Resende forces [the military's candidate for State governor] were more than willing to offer future programs that would be of benefit to the local leaders and their dependents. Roads, schools, electric power facilities, agricultural programs, and so on were the primary inducements." Although developed for a different context, Grossman (1994) provides a theoretical framework that captures this relationship. In receiving federal funds which increase their reelection probabilities, state or local politicians promise to place their political support for federal politicians. It follows that local politicians, who are effective at raising political support will receive relatively more federal outlays.

If this were the appropriate model, then we might expect public works to be allocated relatively more to municipalities where mayors possess more political control. Although political power is difficult to measure, for Brazil the size of the budget devoted to public employment and the proportion of votes that the mayor received in the previous election might be good indicators. We find however, that neither indicator predicts the distribution nor size of the outlays.<sup>11</sup> We also interact political support with our measures of

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<sup>11</sup>In the regression presented in column 3 of Table 5 the coefficient on public employment is 0.001 with a robust standard error of 0.001 and on the mayor's vote share was 0.037 with a robust standard error of 0.086. In the regression presented in column 3 of Table 4 the coefficient on public employment is 0.0001 with a robust standard error of 0.012 and

political power to see if patronage varied along this dimension but again find nothing. Although we cannot definitively reject this interpretation, at least in aggregate we do not find any evidences consistent with this hypothesis.

### *Dynamic Considerations*

Another possible source of contamination is a dynamic relationship between outlays across electoral cycles. In this model, where outlays have an autoregressive relationship across electoral cycles, if previous federal outlays determine future electoral support, then our parameter is also capturing the autocorrelation between budgetary amendments.<sup>12</sup> Without knowing how previous outlays feed into current outlays, it is difficult to predict in which direction our estimates would be biased. We would however, expect a more severe bias among incumbent politicians who have issued budgetary amendment in previous election cycles.

Although we cannot directly test for this bias, there are at least two reasons why this model may be inappropriate. First, federal deputies were only allowed to issue outlays after the constitutional reform of 1988. This implies only two electoral cycle in which incumbents could establish any reputation effects. Secondly, compared to deputies who were elected, non-elected deputies exhibit relatively similar allocation behavior. To demonstrate this, we re-estimate equation 5 interacting vote shares with an indicator for whether the deputy was elected or not. The interaction term, reported in column 6 of Table 6 is not statistically significant with a point estimate of -0.022 and robust standard errors of 0.103.<sup>13</sup> There is however, a 13.7 percentage point difference in the probability of allocating a budgetary amendment between elected and non-elected deputies (see column 3 of Table 6). Although this difference is statistically significant, the estimated patronage effect for non-elected deputies is still quite large.

### *Other Considerations*

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on the mayor's vote share was 8.01e-06 with a robust standard error of 0.00006.

<sup>12</sup>A similar yet slightly more complicated story could be told for campaign spending or vote buying. If these endogenous variables do in fact feed into the allocation of public spending, our estimation equation would represent a reduced-form equation. Our concern then is that some unobserved determinant of campaign spending or vote buying is correlated with a deputy's share of votes in a municipality.

<sup>13</sup>This result is also inconsistent with a campaign spending/vote buying hypothesis since we would expect elected and non-elected deputies to differ significantly in both of these resources.

Included in the specifications reported in Table 6 are two variables intended to further test the robustness of our findings. In addition to party affiliation, Columns 2 and 5 of Table 6 include an indicator for whether the mayor is the same gender as the deputy, and an indicator for whether the deputy was born in same municipality. While common gender does not affect the distribution of budgetary amendments, place of birth does play an important role only in the amount of expenditures allocated to the municipality. However, as discussed, our coefficient on political patronage is statistically the same as in the original specifications, which are replicated in columns 1 and 4.

## 6.2 Public Goods

In the previous section, we presented evidence suggestive of political patronage: federal deputies submit budgetary amendments for public works in municipalities where they received more political support. How deputies decide between different projects may also be influenced by previous electoral outcomes. Scott (1972) argues that goods that cannot be narrowly targeted to reward supporters and exclude detractors, are unsuited for clientelistic exchange and therefore will be underprovided. Although geographically these public works are provided in a particularistic fashion, unless the incumbent had received support from the entire municipality, there may exist additional incentives to strategically distributed goods according to their degrees of exclusion.<sup>14</sup> As Cox and McCubbins (1986) assert: "Capital goods such as parks, fire departments, hospitals, public libraries, public housing, jails, museums, and so forth are both durable - lasting a long time- and relatively difficult to target finely (i.e., to direct the benefits of the service to individuals)...That they are difficult to target finely means that it is difficult to provide middle-class Republicans with an art museum without also providing middle-class Democrats with one...Only when geographic and political groups coincide as they of course sometimes do, does our theory [of rewarding core supporters] apply."

Figure 3 displays the percent of projects devoted to each of six broadly-defined categories.<sup>15</sup> Approximately 44 percent of the outlays are projects

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<sup>14</sup>While these public investment may create some spillover effects in neighboring municipalities, it is unlikely that politician benefit politically from these second-order effects.

<sup>15</sup>To categorize these project types, we use the classification provided by the Federal government. Although these categories are defined fairly broad, some subclassification is possible. Unfortunately, the project description does not allow us to group these public works according to any clear levels of "publicness". Because our results may depend on how we regroup the projects, we maintain the original classification and simply argue that projects in some areas are easier to target than others.

to improve some area of health or sanitation. Health is broadly classified to include such items as hospital renovations and construction, purchase of medical equipments, where as improving drainage or construction of a water reservoir is classified under sanitation. The proportion of projects devoted to education, infrastructure, and agriculture are all relatively equal. When we look at the dollar amount per project, we see that in general the amount is roughly comparable across project types (see Figure 4).

Our first indication that vote shares may affect the type of public investment allocated is displayed in the cumulative distribution of vote shares across three different types of public works: health, infrastructure, and education. Figure 5 shows that investments in infrastructure first-order stochastically dominate health investments, which in turn then dominate education projects. This figure suggests that deputies tend to allocate projects devoted towards roads and urban construction in municipalities where they receive a higher share of votes. Conversely, investments that are more excludable, such as renovation of a primary school, appear in municipalities with lower vote shares.

There exist, however, reasons why this correlation might be spurious. If instead budgetary amendments are distributed according to the particular needs of a municipality then vote share may be capturing deputies that campaigned on these issues. For example, a municipality that needs rural development projects may support a candidate whose policies favors the agricultural sector. If elected, the politician will implement rural development projects in this municipality based on its needs and not necessarily because of political support. Fortunately, equation 5 employs both deputy and municipality fixed-effects, which control for a municipality's needs and deputy characteristics. In effect, estimation of this equation allows us to investigate whether political support plays a role in the type of public good allocated, independently of the municipality's demand for that good.

For each of six project types, Table 7 reports the effect of a deputy's degree of political support on both the decision of whether to allocate that type of project and the decision of how much to allocate conditional on rewarding an outlay of that project type. Each coefficient is estimated from our model that controls for both deputy and municipality fixed-effects. Column 1 presents the impact of vote shares on the probability of a deputy providing a project in each of the following areas: education, sports, hospital, sanitation, infrastructure, and agriculture.

According to Cox and McCubbins (1986), we would expect capital goods that are harder to target to be distributed to municipalities where political support was higher. The results presented in column 1 and 2 is fairly

consistent with this interpretation. We see for example, that the degree of political support affects both the probability of receiving a health project and its size (assuming larger projects are more expensive). In effect, a 10 percent increase in vote shares increases federal outlays directed to health by 7.3 percent which is almost 1.7 larger than of the aggregate estimate.

In the Brazilian context, this result perhaps has two interpretations. First, the provision of health care is a universal right in Brazil and thus difficult to target. Accordingly, health care will be targeted to municipalities that provide more political support. Secondly, health care has always been an important source of political power in local politics. The best example of this is given in the case study of a municipality in Minas Gerais during the mid-1960's, which describes a local doctor, whose control over a federally-funded health clinic provided him the political strength to survive the military takeover (Greenfield 1977). This result lends indirect support to the implicit contract between federal deputies and local mayors which in aggregate the data did not support.

Interestingly, the effects of vote shares on the probability of receiving a project in education and sanitation are negative (although the effects for education are not precisely measured). This is again consistent with the theory, if we believe that these goods are easier to target. The construction of a technical school for example, or providing drainage for a neighborhood are relatively more excludable and can be targeted without much political waste to a municipality where support is weaker. Moreover, the size of the project is still positively associated with more political support, suggesting that as projects become bigger in size they become harder to target. We would however, have expected a more pronounced effect on infrastructure projects, since as similar to health it is much harder to target narrowly. And although the point estimate is positive, the coefficient is not statistically significant.<sup>16</sup>

While these results are relatively consistent with a theory proposed by Cox and McCubbins (1986) and others, it by no means represent a direct test. The fact that political support appears to affect both project type and size does, however, suggest social and economic inefficiencies in the allocation of these public goods. Which of course, begs the question of what type of impact these public investments have had on local welfare. We comment on this issue next.

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<sup>16</sup>When we restrict infrastructure projects to just urban housing projects, the point estimate is significantly positive.

### 6.3 Local Development

In the section, we ask the question "Do these public investment affect local development?" As large-scale urban and rural development programs, these public works could potentially have important economic and political consequences, by increasing the productivity of private investment, providing indirect employment, access to basic amenities, and lowering market transaction costs. On the other hand, if political pathologies exist, whereby political incentives do not coincide with the needs of a municipality, then these budgetary amendments may actually have very little impact on local welfare (Robinson 2003).

Figure 6, in depicting the log relationship between a municipality's average per capita income in 2000 and the total dollar amount of federal outlays invested from the previous 1996-1999 electoral cycle, illustrates that these public investment may have in fact increased local welfare. This simple cross-sectional relationship is positive and nonlinear, with a large increase in per capita income associated with municipalities that have received more than R\$500,000 in public goods. While Figure 6 suggests a positive impact on average income, Figure 7 displays a potential distributional effect as well. This figure shows a slight positive correlation between a municipality's income equality and the log amount of federal outlays. In effect, the distribution of public works has benefited the upper tail of the income distribution. The remaining analysis explores the robustness of these relationships.

#### Per capita Income

##### *Cross-sectional and Fixed-effects Results*

We begin by assuming a linear specification to estimate the effects of federal outlays on the average per capita income of a municipality. Econometrically, we estimate the following basic relationship,

$$y_i = \alpha + \theta f_i + x_i' \beta + \epsilon_i \quad (6)$$

where  $y_i$ , expressed in logarithms, denotes real average per capita income in municipality  $i$ .<sup>17</sup> The variable  $f_i$ , also expressed in logarithms, represents the sum total of each outlay distributed by a federal deputy in the previous

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<sup>17</sup>Using per capita income could be potentially be a source of bias if migrants are attracted to the municipalities that have benefited from federal outlays. In this case, our estimates are biased downward.

electoral cycle, and is expressed in real terms. A set of municipal characteristics that determine average income is contained in the vector  $x_i$  and  $\epsilon_i$  represents all the unobserved determinants of a municipality's per capita income level.

The first two columns of Table 8 report the OLS estimates of the association between the amount of federal outlays a municipality received and its per capita income. Column 1 is based on a specification that only controls for a set of basic demographic characteristics, and some structural features of the municipality, such as whether it is the state's capital and its total land area. The second column corresponds to a specification that include additional controls to capture differences in institutions and infrastructure across municipalities. Sample sizes, which are reported along with the adjusted  $R^2$ 's, reflect the number of municipalities with non-missing information in the set of controls used in the estimation.

Focusing on the first specification, column 1, the coefficient on federal outlays is positive and statistically significant, confirming the general relationship depicted in Figure 6. However, the estimated effect of federal outlays is not only small but loses significance when other controls are included, see Column 2.<sup>18</sup> Given the cross-sectional nature of these OLS estimates, it is not surprising that the OLS estimates are sensitive to specification. The inability to control for such characteristics as the initial endowment of natural resources or access to markets could potentially bias our estimates severely downward if federal outlays were distributed according to need.

The next two columns report specifications that try to reduce the extreme differences in observable and unobservable characteristics across municipalities, by exploiting micro-region fixed-effects. A micro-region classification was created in the 1960's by the Brazilian Institute for Geography and Statistics (IBGE) to cluster municipalities that were considered homogenous in terms of their natural resources, economic production, and general level of political and social integration. Assuming that municipalities classified in the same micro-region are relatively similar, we can exploit this within-cluster variation to purge much of the omitted variable bias that plagues our OLS estimates.<sup>19</sup>

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<sup>18</sup>The additional set of controls includes several variables that are clearly endogenous, which could be biasing our estimate downward. We introduced this specification to demonstrate the robustness of our other estimation approaches. In general, various specifications can demonstrate the non-robustness of our OLS estimates.

<sup>19</sup>Focusing on within cluster variation is a cause for concern if these public investments create large spillovers between municipalities in a micro-regions. In this case, we will underestimate the impact of federal outlays.



As an indirect test of this assumption, we compare the correlation of average log per capita income within a micro-region to the correlation across micro-regions. With a sample 547 micro-regions, clustering an average of 6.7 municipalities, the estimated intraclass correlation coefficient is 0.85 with an asymptotic standard error of 0.10. This suggests that 85 percent of the total variation is due to variation across micro-regions. Differences in per capita income (and subsequently its determinants) within micro-regions should be small relative to the differences across micro-regions.

The fixed-effects estimates, reported in columns 3 and 4, while comparable to the first OLS estimate, are both highly significant and stable across specifications. The estimate in Column 3 suggests that a 10 percent increase in federal outlays (R\$100,000 per municipality) over the electoral cycle will increase average per capita income by 0.12 percent per month, or equivalently R\$0.25. As a pure income transfer the estimated impact of federal outlays on welfare is relatively small, given that minimum wage in 2000 was R\$240.00 per month.

Alternatively, we can consider the fact that these federal outlays are public good investments, and interpret this coefficient as an internal rate of return. This interpretation assumes that income per capita in 2000 is an approximate measure of the average yearly profit stream from these public works investments. Compared to an average real interest rate of roughly 15 percent during the 96-99 electoral cycle, these outlays could also be seen as poor investments.

#### *Instrumental Variable Estimates*

Although micro-region fixed-effects may have reduced much of the omitted-variable bias, federal outlays are not randomly dispersed within micro-regions. Unobserved differences across municipalities could still bias our estimates. Here, we use instrumental variables estimation to try to resolve these potential concerns.

Our instrumental variables approach exploits the anecdotal and empirical evidence which suggest that politicians reward political support with federal outlays. This political behavior along with the event that some politician became deputies as alternates represents the mechanism and exogeneity assumption of our proposed instrument. To capture this patronage relationship at the municipality level, our instrument is the total number of non-elected deputies (*suplentes*) that were provided political support by a

municipality.<sup>20</sup> With these *suplentes* representing approximately 24 percent of deputies that executed federal outlays, their behavior is not inconsequential and do represent a positive shock for those municipalities that provided electoral support. For the validity of this instrument, we argue that the act of these alternates becoming deputies is a quasi-random event from the perspective of the municipality prior to the election. We consider it unlikely that a municipality would support a candidate based on the probability that he becomes a deputy as an alternate. Assuming that these alternates "randomly" became deputies, we then exploit their tendency to allocate their outlays to the municipality where they received political support. Thus municipalities that happened to support these alternates who later executed outlays received an unexpected shock of public investment.

As a necessary condition for an instrument, Figure 8 depicts the unadjusted correlation between the log amount of federal outlays and the number of alternates supported politically by a municipality. It shows that those municipalities that provided support to the largest number of non-elected deputies are also the ones that received the most federal outlays. Taken together with both the anecdotal evidence and the empirical analysis of the previous section, this plot provides suggestive evidence of a direct link between political support for non-elected deputies and the receipt of federal outlays.

The two-stage least squares estimates are reported in Columns 5 and 6 of Table 8, replicating the fixed-effects specifications for comparison. The estimated effect of federal outlays on per capita income is both positive and highly significant. The point estimate is roughly 8 times higher than the fixed-effects and OLS estimates. An elasticity of 0.071 suggests that a 10 percent increase in federal outlays will increase per capita income by R\$1.82 per month. Or following the investment interpretation, an estimated internal rate of return of 0.071, while closer, is still below the average real interest rate during this period.

### *Semi-parametric Estimation*

Here, we specify a slightly more flexible relationship between federal outlays

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<sup>20</sup>We have experimented with several other instruments: 1) an indicator variable for whether or not the municipality gave a top ranking to an elected deputy, 2) the average vote shares among elected deputies, 3) the total number of deputies who had received their maximum share of vote in that particular municipality (both weighted and unweighted). Interestingly, all of these potential instruments gave qualitatively the same results, if not in some cases a similar quantitative result.

and per capita income to explore the convexity depicted in the Figure 6. We estimate a model originally proposed by Robinson (1988) which allows federal outlays to be estimated non-parametrically while still controlling for the determinants of per capita income.<sup>21</sup> Econometrically, we estimate the following equation:

$$y_i = \alpha + g(f_i) + x_i'\beta + \epsilon_i. \quad (7)$$

which is similar to equation 6, except that  $g(\cdot)$  is some unknown functional form. Due to the potential endogeneity of federal outlays, we follow Blundell and Duncan (1998) and specify the following relationship for federal transfers,

$$f_i = \gamma + \pi z_i + \nu_i,$$

where  $z_i$  denotes our instrument, and  $\nu_i$  is a random error term. The key assumption underlying the estimation of this model is that  $E(\epsilon|x, \nu) = 0$ , i.e. conditioning on  $\nu_i$  corrects for the potential endogeneity of federal outlays.

Taking expectation and subtracting, we can rewrite equation 7 as follows,

$$y_i - E(y|x) = (v_i - E(v|x))\rho + \epsilon_i,$$

which implies the following estimator for  $g(x)$

$$g(\hat{x}) = (y_i - E(y|x)) - (v_i - E(v|x))\hat{\rho}. \quad (8)$$

Since  $\pi$  and  $\rho$  converge at  $\sqrt{n}$ ,  $g(\hat{x})$  converges at  $\sqrt{nh}$  where  $h$  is the bandwidth size (Robinson 1988).

Figure 9 displays the estimated returns to federal outlays along with the 95 percent pointwise confidence intervals.<sup>22</sup> The marginal returns of federal outlays increase sharply around the R\$1.2 million mark. For low amounts of federal outlays, the returns are close to the OLS estimates and bordering on statistical insignificance. Beyond this threshold, the average marginal value of outlays is approximately 0.084, and statistically significant.

## Inequality

While federal outlays may have increased the municipality's average income per capita, Figure 7 suggests that access to these public works may not have

<sup>21</sup>A completely nonparametric specification, while ideal, is computationally prohibitive given the large number of determinants.

<sup>22</sup>A locally-weighted regression, with a 0.7 bandwidth was used to estimate the conditional expectations in equation 8. These estimates are robust to slight perturbations of the bandwidth size.

been equal; a possibility which is not without historical precedence. The National Department of Works Against the Droughts (DNOCS), designed to mitigate the harsh impact of droughts in the Northeast provides an unfortunate example of this behavior. As Roett (1999) describes: "While the Northeast congressional delegation was successful in funding DNOCS, none of the funds went to alleviating poverty. Monies were spend on roads and irrigations projects for the large landowners and their acolytes." Roett (1999) also goes on to write: "In response to a terrible drought in 1953, the Vargas government created the Bank of the Northeast (BNB) in 1952; it quickly became a marginal think tank with little impact on policy other than to provide short-term credit to big farmers." The results of this section imply a similar trend. We present evidence to suggest that the allocation of public investment has contributed to increasing inequality in Brazil.

Table 9 reports the effects of federal outlays on income inequality, assuming the linear specification in equation 6. Columns 1 and 2 report the fixed-effects estimates according to our usual two specifications, while the IV estimates follow in columns 3 and 4. Our dependent variable is a Gini coefficient calculated for each municipality using income per capita from the 2000 population census. Once we've restricted our sample to include only the municipalities for which we have a complete set of covariates, average municipal inequality is approximately 0.53, with a standard deviation of 0.07.<sup>23</sup> As before, sample sizes and  $R^2$ 's are also reported.

Focusing on the fixed-effects estimate in columns 1 and 2, the within micro-region variation estimates little difference across specifications. The estimated effect of federal outlays on inequality, while statistically significant, is positive yet small. The fixed-effects estimate in column 2 suggests that a 10 percent increase in federal outlays will increase income inequality in a municipality by roughly 0.0005 percentage points. In comparison, our IV approach estimates a coefficient that is 10 times the fixed-effects estimates, suggesting that the impact of federal outlay on income inequality is considerable. The IV estimate reported in Column 4, indicates that an additional R\$100,000 in a municipality translates into a 1.5 percent increase in income inequality. These results suggest that access to these public investments are not only unequal but tend to benefit more the upper tail of the income distribution.

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<sup>23</sup>IBGE reports a estimated Gini of 0.60. One difference is that their Gini is based on the head of household's income only, where ours is based on the household's per capita income.

### *Type of Public Investment*

Thus far, we have explored the impact of federal outlays on per capita income and inequality without distinguishing the different types of public works that these budgetary amendments specify. One might expect investments in education, for example, to have a different impact on income per capita than perhaps health. Here, we investigate the heterogeneity in impact across three broad categories of federal outlays. Table 10 reports the IV estimates for the effects of public investments in health, education, and infrastructure on average per capita income and income inequality. The first two columns report the estimated impact on income per capita, and the last two columns correspond to the impact on income equality. Columns 1 and 3 correspond to our base case specification with micro-region fixed-effects, as reported in the previous tables; column 2 and 4 represent our full specification. As before, sample sizes and  $R^2$ 's are reported for each regression.

To increase per capita income, investments in education and infrastructure provide the largest returns (see columns 1 and 2 of Table 10). Which is an intuitive results considering that these are generally viewed as direct channels towards generating income. The estimates suggest that a 10 percent increase in investments directed towards education or infrastructure will increase per capita income by close to 2 percent. These point estimates, although similar across specifications, are estimated much more precisely in the base case specification. These income elasticities also imply that investments in education and infrastructure were profitable when considering the average interest rates during this period; and, with an average return of 0.107, investments in health are almost profitable. Note that while these investments in education, health, and infrastructure have a direct impact on income, these estimates capture a Keynesian multiplier effect as well. In addition to improving health care and access to markets, these public works increase local employment and general economic activity.

As in aggregate, each project type contributed significantly to local inequality (see columns 3 and 4). Investment in education, while generally considered to have a progressive impact on inequality, has a Gini elasticity of 0.148. Expenditure on health and infrastructure are much less regressive, with an associated increase in inequality of around 7 percent. These estimates are consistent with those by Bravo, Contreras, and Millan (2002) in (de Ferranti et al. 2003). Comparing Gini income elasticities across 6 Latin American countries, they find for Brazil that income inequality is associated with an increase of 6 percent for public expenditures in health, 35 percent for infrastructure, and 39 percent for education.

## *Heterogeneity*

Given our assumptions, our results are somewhat puzzling: public goods, generally considered as progressive, have in fact increased inequality within a municipality. And yet, if local elites capture these public works within a patronage system, as several Brazilian scholars have suggested (Roett 1999) (Mainwaring 1999), then an increase in inequality may be a natural consequence. Figure 10, which displays variation in the return to public works along various municipal characteristics, explores this hypothesis further.

Elite capture is difficult to measure directly. As such, we rely on a municipality's land inequality and level of political competition as possible proxies for this concept. Access to land has traditionally been an important source of political power and a defining characteristic of Brazil's political oligarchy (Leal 1948). We would expect that municipalities with higher land inequality suffer from more clientelism and elite capture. The effective number of political parties in the 2000 election for mayor is intended to represent the current mayor's political dominance, which may also be correlated with potential capture.

Figure 10(a) displays the impact to public works on income and inequality when interacted with the degree of 1996 land inequality in a municipality. While the effect of public works on income per capita is uncorrelated with a municipality's level of land inequality, high land concentration is associated with relatively higher federal outlay effects on local inequality. In effect, federal outlays increase inequality almost twice as much in municipalities characterized by high land inequality.<sup>24</sup> Figure 10(b) conveys a similar message. In politically competitive municipalities, federal outlays are not only associated with slightly higher returns to per capita income but are also relatively less regressive in their effects on inequality. Compared to municipalities where there was effectively only one party in the 2000 municipal elections, the effect of public works on inequality is roughly 3 times lower in municipalities where at least 6 political parties competed.<sup>25</sup>

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<sup>24</sup>For income, the IV coefficient on federal outlays was 0.075 with a robust standard error of .028; and the coefficient on the interaction term was 0.003 with a robust standard error of 0.038. For inequality, the IV coefficient on federal outlays was .029 with a robust standard error of .011; and the coefficient on the interaction term was 0.034 with a robust standard error of 0.014.

<sup>25</sup>For income, the IV coefficient on federal outlays was 0.063 with a robust standard error of 0.020; and the coefficient on the interaction term was 0.003 with a robust standard error of 0.005. For inequality, the IV coefficient on federal outlays was 0.066 with a robust standard error of 0.009; and the coefficient on the interaction term was -0.007 with a

Figures 10(c) and 10(d) investigate the potential of elite capture from a constraint perspective. Figure 10(c) compares the returns to federal expenditure between municipalities with and without an agency of civil defense.<sup>26</sup> While figure 10(d) explores the variation in impact along a municipality's proportion of social councils that have deliberative (as opposed to strictly advisory) powers.<sup>27</sup> Social councils, comprised of government and non-governmental segments of civil society, are designed to monitor social programs and local public expenditures. In both cases, these local institutions have a positive effect on the return to federal outlays on per capita income. Municipalities with a high proportion of effective social councils, for example, are associated with an income elasticity of 0.11 percent, compared the aggregate elasticity of 0.07. Moreover, as figures 10(c) and 10(d) demonstrate, this relative increase in per capita income is not associated with higher inequality effects.

If these public works projects have increased local income inequality, some of the exacerbating factors in the Brazilian context are associated with a lack of political competition and the absence of local institutions that promote voice and accountability. Although we do not provide a direct test of local capture, these results, in complementing Brazil's existing anecdotal evidence, provide suggestive evidence that local capture of these public works projects may have led to the increase in inequality, but also that this effect can be attenuated by local institutions that promote democracy and citizen participation and oversight.

### *Estimation Concerns*

The critical assumption, underlying our results, is that the number of non-elected deputies politically supported by a municipality is uncorrelated with any unobserved determinant of income per capita or income equality.

An important data limitation, which would invalidate this assumption, is

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robust standard error of 0.002.

<sup>26</sup>For income, the IV coefficient on federal outlays was 0.041 with a robust standard error of 0.015; and the coefficient on the interaction term was 0.052 with a robust standard error of 0.008. For inequality, the IV coefficient on federal outlays was 0.056 with a robust standard error of 0.007; and the coefficient on the interaction term was -0.009 with a robust standard error of 0.003.

<sup>27</sup>For income, the IV coefficient on federal outlays was 0.051 with a robust standard error of 0.016; and the coefficient on the interaction term was 0.065 with a robust standard error of 0.017. For inequality, the IV coefficient on federal outlays was 0.057 with a robust standard error of 0.007; and the coefficient on the interaction term was -0.0148 with a robust standard error of 0.007.

if these federal transfers represent only a fraction of the patronage that flows into a municipality. A positive covariance between a municipality's level of political support for non-elected deputies and other types of patronage would bias our IV estimates upwards.

There are at least two reasons why our estimates may not suffer from this bias. First, access to other forms of patronage is most likely limited for non-elected deputies, who are not significant actors in the political arena. Moreover, their access to other patronage is expectedly small compared to this federal source. Second and more importantly, our full specification controls for the average amount of both federal and state level resources that is transferred to the municipality over the electoral cycle; and, our point estimate remains constant across specifications.

It is also worth mentioning that our full specification (see column 6 of Table 8 and column 4 of Table 9) also accounts for a measure of political competition.<sup>28</sup> Controlling for the level of political competition in a municipality is critical since municipalities that are more politically competitive, in the sense that several candidates are voted upon, may have a higher probability of having an alternate become a deputy.<sup>29</sup> Again, including political competition as a control leaves our estimated effect unchanged.

## 7 Conclusions

The Constitution of 1988 - in its extension of the electoral suffrage, constitutional guarantees of freedom of the press and formation of political parties, and decentralization of fiscal powers to local and state governments - was largely considered a landmark event in Brazil's progress towards democratic consolidation. The Constitution also granted members of the Chamber of Deputies the right to submit budgetary amendments for the provision of public works projects to municipalities, thus creating opportunities to engage in political patronage.

This paper investigates the extent to which political support affects the distribution of these public investments both in the size of the public work and its type. Consistent with a "core-supporters" model, we document a

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<sup>28</sup>To measure political competition, we use the effective number of political candidates, which is a common measure in the political science literature. This measure essentially weights the number of candidates by their proportion of votes received. Our results are also robust to using the number of deputies and number of alternates.

<sup>29</sup>This example does tread a fine line in that the elections cannot be so competitive so that every candidate loses.



strong association between the allocation of public works during the 1996-1999 electoral cycle and the degree of electoral support received in the 1994 elections. A mere 10 percentage point increase in political support implies an expected increase of R\$75,174 in public works for a municipality during the electoral cycle. Moreover, political motivations influence the type of public work the municipality receives, despite its local needs. Because these public goods vary in their degree of exclusion, politicians prefer to allocate goods that are less excludable to municipalities where they received more political support.

With the allocation of public investments manipulated to meet political objectives, we examine the impact of these public works on local welfare. Our findings show that federal outlays are in fact associated with an increase in a municipality's average per capita income. Thus, despite evidence of political patronage some level of efficiency has been achieved. We do, however, also find that the increase in income, does come at the expense of increased inequality. The increase in local inequality implies that within the municipality access to these public works are not only unequal but tend to benefit more the upper tail of the income distribution.

Our result that public goods provision has led to local inequality, while surprising, is consistent with the anecdotal evidence of local elite capture. To explore this hypothesis further, we investigate the heterogeneity in the effects of these public investments on both income and inequality. We observe that the level of political competition and the existence of institutions that foster vigilance and accountability, characteristics that are presumably negatively correlated with local capture, influence the efficiency and equity of the impact of these federal outlays. In particular, the impact of public works are much less regressive in municipalities that are more politically competitive and where land less concentrated. Additionally, outlays are more efficient among municipalities with functioning social councils or where there exist a civil defense agency.

Patronage has been regarded as the principal impediment for equity-enhancing reform in Brazil, and in aggregate our results further this argument. Perhaps more importantly however, our findings highlight the importance of local context in determining the success of these redistributive reforms. With Brazil's move towards decentralization, the influence of local institutions on the success of redistributive policies become more pronounced. Future research is needed to better understand how public resources are allocated within a municipality, and how local institution determine this distribution.

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## 8 Tables

Table 1: The Distribution of the Federal Deputies Across States

	Number of Federal Deputies	Population
Acre	8	557,226
Alagoas	9	2,819,172
Amazonas	8	2,813,085
Amapá	8	475,843
Bahia	39	13,066,910
Ceará	22	7,418,476
Distrito Federal	8	2,043,169
Espírito Santo	10	3,094,390
Goiás	17	4,996,439
Maranhão	18	5,642,960
Minas Gerais	53	17,866,402
Mato Grosso do Sul	8	2,074,877
Mato Grosso	8	2,502,260
Pará	17	6,189,550
Paraíba	12	3,439,344
Pernambuco	25	7,911,937
Piauí	10	2,841,202
Paraná	30	9,558,454
Rio de Janeiro	46	14,367,083
Rio Grande do Norte	8	2,771,538
Rondônia	8	1,377,792
Roraima	8	324,152
Rio Grande do Sul	31	10,181,749
Santa Catarina	16	5,349,580
Sergipe	8	1,781,714
São Paulo	70	36,969,476
Tocantins	8	1,155,913
Total	513	169,590,693

Source: [www.camara.gov.br](http://www.camara.gov.br)

Table 2: Budgetary Amendments Over the Electoral Cycle

Year	Number of Outlays	Average Number Per Deputy	Standard Deviation	Average Amount per Deputy	Standard Deviation
1996	3859	16.82	3.41	1,370,380	380,295.4
1997	4955	16.72	3.20	1,335,346	200,642.7
1998	6106	14.35	3.96	1,300,812	194,080.3
1999	5275	13.28	4.31	1,266,827	229,759.3
Total	20195	15.12	4.07	1,313,702	253048.100

Table 3: The Difference in Political Performance in Issuing a Budgetary Amendment

	No Outlays	Outlay	Difference
Municipal Vote Share	0.015 (0.0002)	0.160 (0.0033)	-0.145 (0.0033)
Win Margin	0.003 (0.0001)	0.064 (0.0024)	-0.061 (0.0024)
Own Vote Share	0.007 (0.0007)	0.076 (0.0061)	-0.069 (0.0061)
Weighted Municipal Vote Share	0.001 (0.0001)	0.019 (0.0013)	-0.018 (0.0013)
Municipal Rank	36.177 (0.4658)	10.180 (0.3347)	25.997 (0.5736)
Number of Observations	204059		

Notes: Standard errors in parenthesis account for correlation among deputies.

Table 4: The Effects of Political Support on the Probability of Issuing a Budgetary Amendment

	(1)	(2)	(3)	(4)
Dependent Variable: Outlay (1/0)	OLS	OLS	OLS	Municipality and Deputy Fixed-Effects
Municipal Share	0.608 [0.018]**	0.608 [0.018]**	0.618 [0.018]**	0.67 [0.011]**
Year Effects	Y	Y	Y	Y
State Effects	Y	Y	Y	N/A
Population	Y	Y	Y	N/A
Deputy Characteristics	N	Y	Y	N/A
Municipal Characteristics	N	N	Y	N/A
Observations	132773	132773	132773	132773
R-squared	0.72	0.72	0.72	0.73

Notes:

- Robust standard errors in brackets account for correlation among deputies.
- \* significant at 5%; \*\* significant at 1%
- Deputy characteristics include gender, education, occupation, age, party affiliation, civil status, incumbency status.
- Municipality characteristics include gender, education, party affiliation, winning percentage, electoral competition for mayor, electoral competition for deputies, whether the municipality has paved roads, shanty-town, incentives to foster economic activity, a job program, a constitution, zoning laws, budget plan, property laws, work laws; the percentage of budget devoted to public employment, number of municipal guards, whether the municipality has state judge; percentage of population living in urban areas, an indicator for whether agriculture, ranging, fishing, industry, or tourism is a top 3 economic activity



Table 5: The Effects of Political Support on the Amount of Federal Expenditure

	(1)	(2)	(3)	(4)
Dependent Variable: Log of Real Expenditure	OLS	OLS	OLS	Municipality and Deputy Fixed-Effects
Municipal Share	0.273 [0.036]**	0.278 [0.035]**	0.375 [0.036]**	0.442 [0.030]**
Year Effects	Y	Y	Y	Y
State Effects	Y	Y	Y	N/A
Population	Y	Y	Y	N/A
Deputy Characteristics	N	Y	Y	N/A
Municipal Characteristics	N	N	Y	N/A
Observations	20195	20195	20195	20195
R-squared	0.59	0.59	0.61	0.63

Notes:

- Robust standard errors in brackets account for correlation among deputies.
- \* significant at 5%; \*\* significant at 1%
- Deputy characteristics include gender, education, occupation, age, party affiliation, civil status, incumbency status.
- Municipality characteristics include gender, education, party affiliation, winning percentage, electoral competition for mayor, electoral competition for deputies, whether the municipality has paved roads, shanty-town, incentives to foster economic activity, a job program, a constitution, zoning laws, budget plan, property laws, work laws; the percentage of budget devoted to public employment, number of municipal guards, whether the municipality has state judge; percentage of population living in urban areas, an indicator for whether agriculture, ranging, fishing, industry, or tourism is a top 3 economic activity

Table 6: Robustness Checks on Political Patronage

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Outlay (1/0)			Log Expenditure		
Municipal Vote Shares	0.672 [.011]**	0.667 [0.011]**	0.539 [0.030]**	0.442 [.030]**	0.407 [0.030]**	0.427 [0.100]**
Same party as mayor		0.015 [0.002]**	0.015 [0.002]**		0.044 [0.011]**	0.044 [0.011]**
Same gender as mayor		0.019 [0.010]	0.017 [0.010]		0.057 [0.035]	0.057 [0.035]
Place of Birth		0.020 [0.011]	0.021 [0.011]*		0.095 [0.029]**	0.095 [0.029]**
Non-elected × Municipal Vote Shares			0.137 [0.031]**			-0.022 [0.103]
Year Effects	Y	Y	Y	Y	Y	Y
Deputy Fixed-Effects	Y	Y	Y	Y	Y	Y
Municipality Fixed-Effects	Y	Y	Y	Y	Y	Y
Observations	132773	132773	132773	20195	20195	20195

Notes:

- Robust standard errors in brackets account for correlation among deputies.
- \* significant at 5%; \*\* significant at 1%

Table 7: Political Patronage by Type of Public Works

Dependent Variable	Proportion of Project Type	Coefficient on Municipal Vote Shares	
		Outlay (1/0)	Log Expenditure
Education	0.059	-0.022 [0.018]	0.079 [0.416]
Sports	0.063	0.017 [0.015]	0.821 [1.41]
Hospital	0.164	0.059 [0.024]*	0.729 [0.179]**
Sanitation	0.279	-0.076 [0.029]**	0.333 [0.142]*
Infrastructure	0.146	0.027 [0.023]	0.348 [0.140]*
Agriculture	0.108	-0.019 [0.019]	0.608 [0.480]
Year Effects	Y	Y	Y
Deputy Fixed-Effects	Y	Y	Y
Municipality Fixed-Effects	Y	Y	Y
Observations	20195		

Notes:

- Robust standard errors in brackets account for correlation among deputies.
- \* significant at 5%; \*\* significant at 1%

Table 8: The Effects of Federal Outlays on Average Per Capita Income

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log per capita income	OLS	OLS	Fixed- Effects	Fixed- Effects	IV	IV
					Second Stage	
Log Federal Expenditure (1996-1999)	0.006 [0.003]**	0.004 [0.003]	0.008 [0.002]**	0.007 [0.002]**	0.075 [0.014]**	0.071 [0.018]**
Adjusted R-squared	0.83	0.84	0.94	0.94	0.91	0.92
					First Stage	
Number of non-elected deputies supported					0.096 [0.009]**	0.081 [0.009]**
F-test					109.94	73.34
R-squared					0.4	0.41
Population	Y	Y	Y	Y	Y	Y
Urban	Y	Y	Y	Y	Y	Y
Area (km)	Y	Y	Y	Y	Y	Y
Prop. of Pop. of Working Age	Y	Y	Y	Y	Y	Y
Capital	Y	Y	Y	Y	Y	Y
Prop. of Pop. Male	Y	Y	Y	Y	Y	Y
Prop. of Pop. Literate	Y	Y	Y	Y	Y	Y
Full Set of Controls	N	Y	N	N	N	Y
Micro Region Effects	N	N	Y	Y	Y	Y
Sample size	4563	4563	4563	4563	4563	4563

Notes:

- Robust standard errors in brackets.
- \* significant at 5%; \*\* significant at 1%
- Full Set of Controls include gender, education, party affiliation, and winning percentage of mayor; electoral competition for deputies, whether the municipality has paved roads, shanty-town, incentives to foster economic activity, a job program, a constitution, zoning laws, budget plan, property laws, work laws; the percentage of budget devoted to public employment, number of municipal guards, whether the municipality has state judge, an indicator for whether agriculture, ranging, fishing, industry, or tourism is a top 3 economic activity

Table 9: The Effects of Federal Outlays on Income Inequality

Dependent Variable: Gini	(1)	(2)	(3)	(4)
	FE		Instrumental Variables	
Log Federal Expenditure (1996-1999)	0.005 [0.001]**	0.005 [0.001]**	0.051 [0.007]**	0.046 [0.009]**
R-squared	0.23	0.25	0.04	0.11
Population	Y	Y	Y	Y
Urban	Y	Y	Y	Y
Area (km)	Y	Y	Y	Y
Prop. of Pop. of Working Age	Y	Y	Y	Y
Capital	Y	Y	Y	Y
Prop. of Pop. Male	Y	Y	Y	Y
Prop. of Pop. Literate	Y	Y	Y	Y
Full Set of Controls	N	Y	N	Y
Micro Region Effects	Y	Y	Y	Y
Observations	4563	4563	4563	4563

Notes:

- Robust standard errors in brackets.
- \* significant at 5%; \*\* significant at 1%
- Full Set of Controls include gender, education, party affiliation, and winning percentage of mayor; electoral competition for deputies, whether the municipality has paved roads, shanty-town, incentives to foster economic activity, a job program, a constitution, zoning laws, budget plan, property laws, work laws; the percentage of budget devoted to public employment, number of municipal guards, whether the municipality has state judge, an indicator for whether agriculture, ranging, fishing, industry, or tourism is a top 3 economic activity

Table 10: The Effects of Federal Outlays on Income Per Capita and Income Inequality By Project Type

Instrumental Variable Estimates	Income Per Capita		Income Inequality	
	(1)	(2)	(3)	(4)
Log Expenditure on Health Projects	0.102 [0.026]**	0.107 [0.037]**	0.07 [0.015]**	0.071 [0.021]**
Observations	3654	3654	3654	3654
R-squared	0.67	0.67	0.03	0.03
Log Expenditure on Education Projects	0.213 [0.097]**	0.245 [0.159]	0.135 [0.058]**	0.148 [0.092]
Observations	2004	2004	2004	2004
R-squared	0.59	0.56	0.01	0.01
Log Expenditure on Infrastructure	0.178 [0.065]**	0.173 [0.090]	0.082 [0.029]**	0.069 [0.037]
Observations	2123	2123	2123	2123
R-squared	0.47	0.52	0.03	0.03
Population	Y	Y	Y	Y
Urban	Y	Y	Y	Y
Area	Y	Y	Y	Y
Prop. of Pop. of Working Age	Y	Y	Y	Y
Capital	Y	Y	Y	Y
Prop. of Pop. Male	Y	Y	Y	Y
Prop. of Pop. Literate	Y	Y	Y	Y
Full Set of Controls	N	Y	N	Y
Micro Region Effects	Y	Y	Y	Y

Notes:

- Robust standard errors in brackets.
- \* significant at 5%; \*\* significant at 1%
- Full Set of Controls include gender, education, party affiliation, and winning percentage of mayor; electoral competition for deputies, whether the municipality has paved roads, shanty-town, incentives to foster economic activity, a job program, a constitution, zoning laws, budget plan, property laws, work laws; the percentage of budget devoted to public employment, number of municipal guards, whether the municipality has state judge, an indicator for whether agriculture, ranging, fishing, industry, or tourism is a top 3 economic activity

## 9 Figures

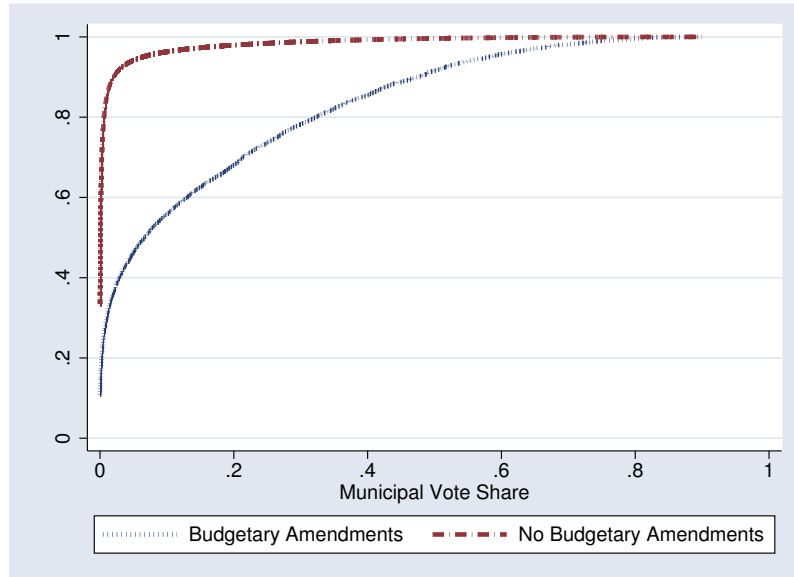


Figure 1: Distribution of Vote Shares By Receipt of Amendment

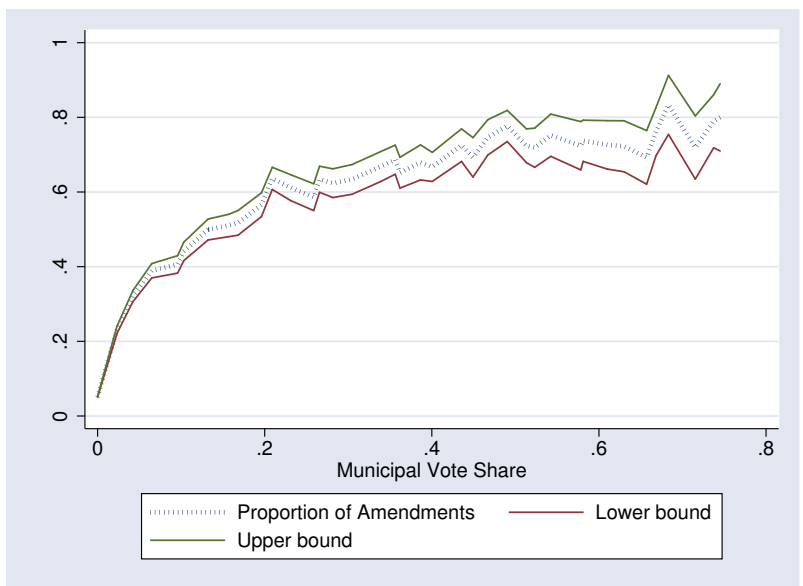


Figure 2: The Probability of Receiving an Amendment

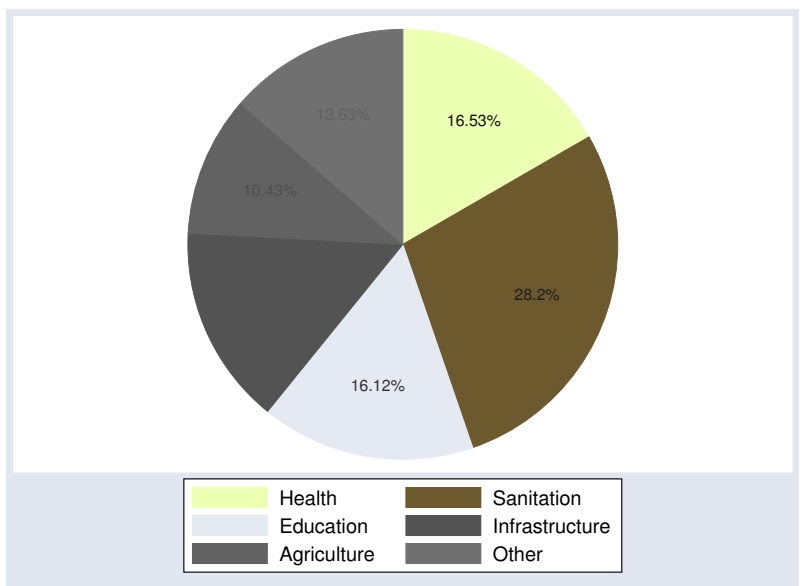


Figure 3: Distribution of Project Types



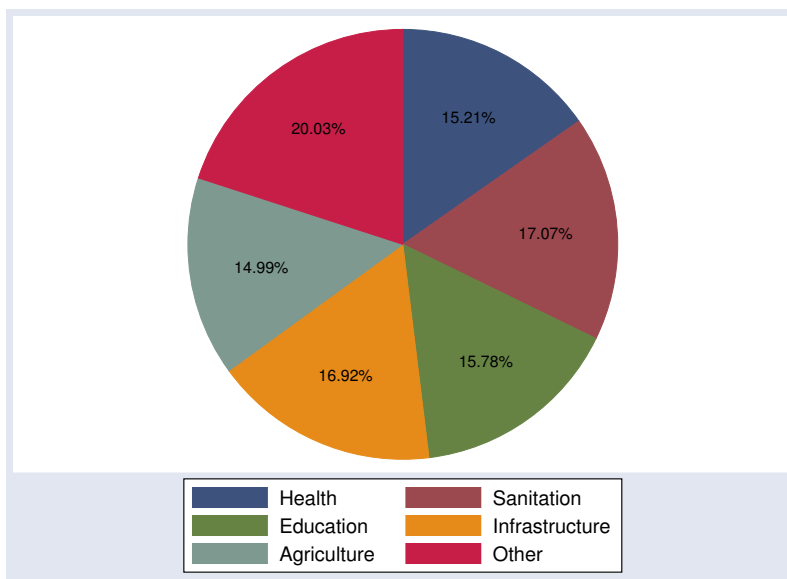


Figure 4: Distribution of Project Type By Dollar Amount

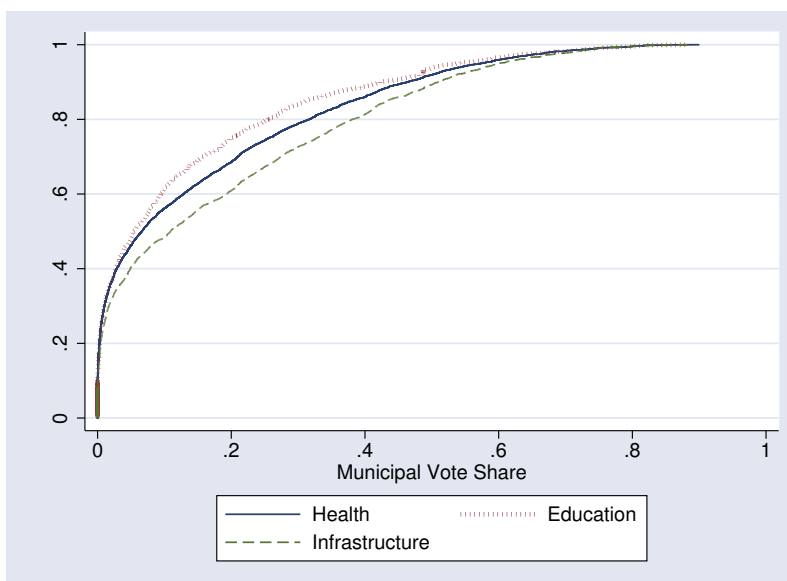


Figure 5: Distribution of Vote Shares by Project Type

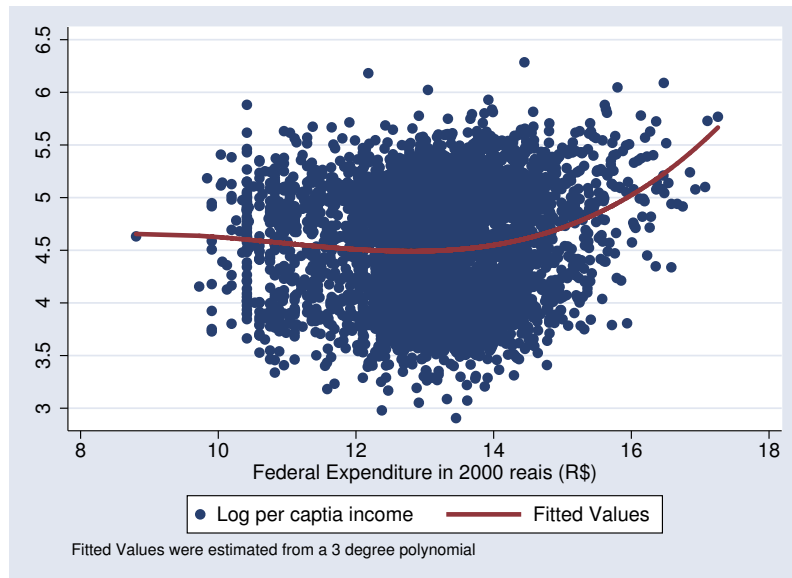


Figure 6: Income Per Capita and 1996-1999 Federal Expenditures

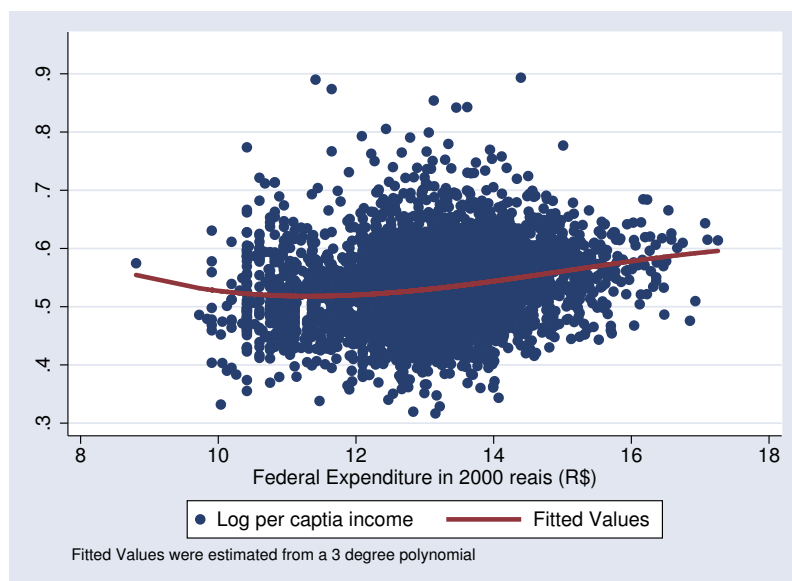


Figure 7: Income Inequality and 1996-1999 Federal Expenditures

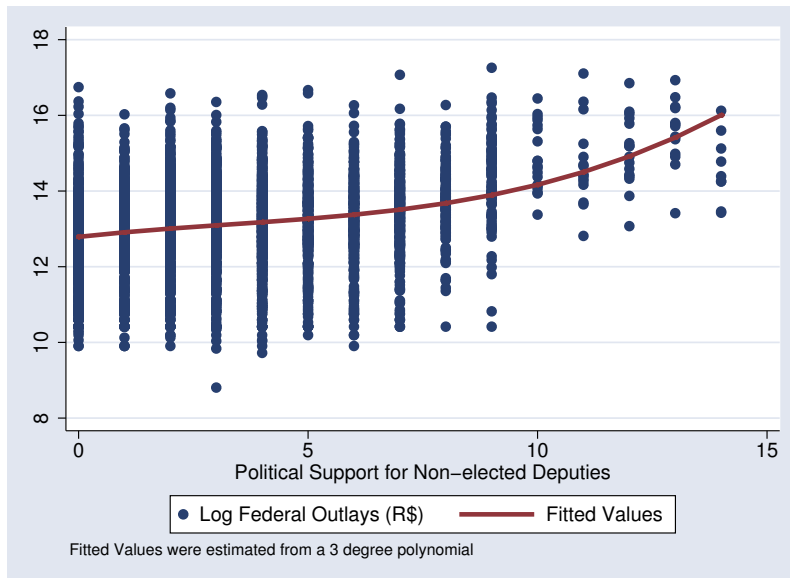


Figure 8: Political Support for Non-elected Deputies and Amount of Federal Outlays

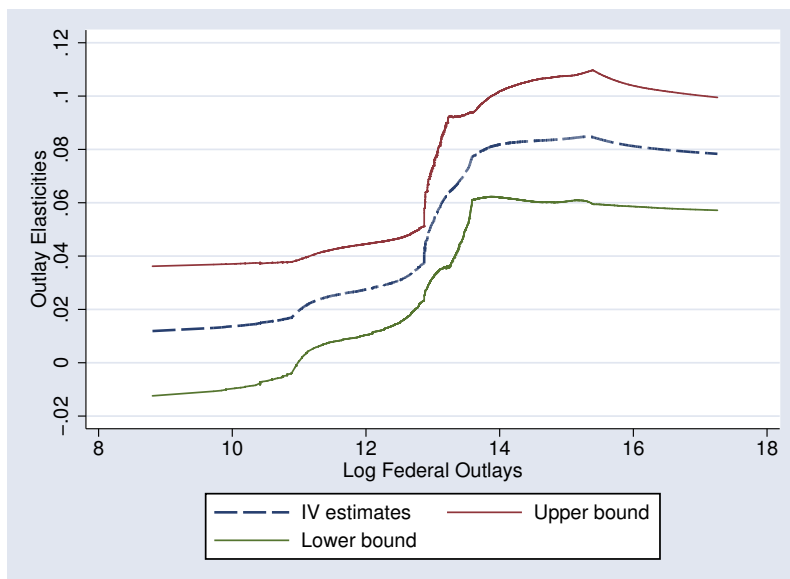
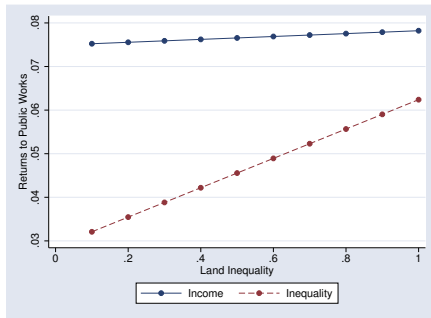
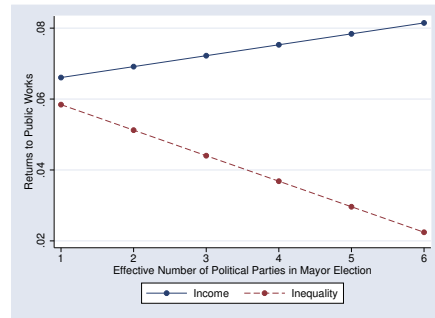


Figure 9: Estimated Effects of Federal Outlays on Per Capita Income



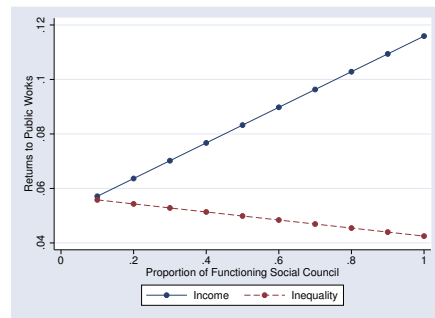
(a) Land Inequality



(b) Political Competition



(c) Civil Defense



(d) Social Council

Figure 10: Heterogeneity in the Return to Public Works

- Notes: With exception of the interaction term, each specification corresponds to the base case IV regressions with fixed-effects.