Poverty reduction, patronage or vote buying?
The allocation of public goods and the 2001 election in Madagascar

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Abstract: Democratic reform and poverty reduction are both broadly accepted as critical goals for developing countries, but there is still disagreement over whether these goals are complementary or conflicting. While democracy should force politicians to worry about the welfare of its citizens out of fear of being voted out of office, it might also create incentives toward policies that will win the most votes regardless of welfare outcomes. This paper focuses on understanding how upcoming election or political patronage concerns might induce governments to deviate from goals such as poverty reduction. A common agency model is developed in which district leaders promise votes to a national leader in return for public investment projects in their districts. The model is tested against competing explanations using data from Madagascar. An analysis of the results from the 2001 presidential election in Madagascar provides insight into the effects of projects—as well as other factors—on voting patterns. The evidence suggests that despite the Malagasy government's stated priority of reducing poverty and inequality in the country, the poorest communes were not targeted in the allocation of public goods . The relative ability of local leaders to attract the attention of national decision makers does affect certain types of public goods allocation, but that these allocations do not necessarily translate into votes for the incumbent leader.

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1. Introduction

Does economic development foster democracy, does democracy foster development, or do these two goals conflict and require trade-offs? Both political scientists and economists have long struggled with this question. While the rapid growth of the East Asian economies in the 1990s seems to support the argument that development needs a strong and unchallenged government, in many parts of Africa, economic crisis ushered in political reform (Gibson and Hoffman 2003). However, it is easy to find examples of both neopatrimonial regimes[1] and nascent democracies in Africa that have failed to improve the standards of living of their citizens. Both the patron-client relations associated with neopatrimonial regimes and upcoming election concerns have the potential to divert resources from development goals such as poverty reduction.

Several recent (unpublished) papers have studied the effect of democratic elections on public goods provision. Mobarak et al. (2004) find that counties in Brazil with a high percentage of voters likely to use health services were more likely to receive such services. Foster and Rosenzweig (2001) find that democratization at the local level increases some types of pro-poor projects. In a developed country context, voting districts that previously had close parliamentary races were more likely to receive inter-regional development transfers in Canada (Milligan and Smart 2003). This paper builds on this emerging literature with a unique modeling approach applied to an African country. I present a common agency model in which district leaders promise votes to a national leader in return for central government-funded public investment projects in their districts. Using data from Madagascar, this model is compared to and tested against two competing explanations of political decision-making: social welfare maximization and political patronage.

Madagascar is an interesting case for exploring targeted public investment spending and elections. Madagascar is one of the poorest countries in the world with a gross national income (GNI) per capita of $260 (World Bank, 2003). The need for public investment of all types in most areas of the country is quite high. With very limited resources, decisions over which districts get the new schools, clinics, roads, etc. are

[1] Neopatrimonialism is characterized by a leadership that retains power through personal relationships. The leader uses political posts and economic policies to create a culture of personal loyalty and dependence, and political office is used for personal gain (Bratton and Van de Walle 1994)

ripe for political influence. While the country made the transition from neopatrimonialism to democracy in the early 1990s, vestiges of the old regime (including its former leader, Didier Ratsiraka, reformed and elected in 1996) remain. The most recent presidential election, the third multi-party democratic presidential election in Malagasy history, was held in December 2001. The race was extremely close and ended with the incumbent President Ratsiraka being forced out after months of strikes and protests that crippled the national economy.

The paper is organized as follows. The next section introduces the three models of spending allocation. In sections III and IV, I describe the political and economic context in Madagascar and discuss the data. The final sections present the econometric models used to test competing explanations of spending allocation, analyze the factors affecting the election results in 2001, and explore the potential distortions introduced by different types of decision-makers.

2. Models of Spending Allocation

In addition to some type of needs-based or social welfare maximization objectives, a government can have competing goals, such as rewarding the incumbent party's political base, or winning the next election. In this section, I present three models of government spending allocation decisions. Model 1 considers the allocation of public projects using social welfare maximization criteria. In Model 2 the incumbent politician is concerned only with rewarding his political base. In Model 3 the politician cares only about winning an upcoming election and uses central government-funded projects to reward local leaders who promise to deliver votes.

Model 1: Social Welfare Maximization

The reference model posits that the government maximizes social welfare, making decisions based purely on need or cost-benefit. The Utilitarian optimum from maximizing the social welfare function is adapted from Persson and Tabellini (2000) for the case in which there are no taxes. The incumbent chooses the vector of public goods spending across districts; p_i is the amount of public goods spending in district i, P is the total budget for projects and U, which is increasing and concave, describes the government's district-specific preferences. N_i is the number of people in group (district) i, N is the total population, and there are L districts.

$$\begin{aligned} &\text{Max}_{p|_{i=1}^{L}} \ \Sigma_i \, (N_i/N) \, U(p_i) \\ &\text{s.t. } \Sigma_i \, p_i \leq P \end{aligned} \qquad (1)$$

The FOC imply

$$(N_i/N) \, U'(p_i) = (N_j/N) \, U'(p_j) \text{ for all } i, j$$

The first order conditions (FOC) in P_i imply that a social welfare maximizer would equalize the weighted sum of marginal benefits across districts. Thus the marginal

benefit of providing public goods is higher for districts with low initial public goods levels, large populations or both.

One specific form of the general $U(p_i)$ specification, consistent with the Malagasy government's stated objective of reducing poverty, would focus on poverty minimization. This poverty minimization problem is:

$$\begin{aligned} &\underset{p_i|_{i=1}^{L}}{\text{Min}} \ \Sigma_i \ (N_i/N) \ FGT_i(p_i) \\ &\text{s.t. } \Sigma_i \ p_i \leq P \end{aligned} \tag{2}$$

The first order conditions imply $(N_i/N) \ \partial FGT_i/\partial p_i = (N_j/N) \ \partial FGT_j/\partial p_j$ for all i, j. Where FGT is the poverty rate, named for the Foster-Greer-Thorbecke class of estimators (Foster et al. 1984). I assume that $\partial FGT_i/\partial p_i<0$ and $\partial^2 FGT_i/\partial p_i^2>0$, and thus that the effect of providing public goods on reducing poverty is higher for districts with low initial public goods levels, large populations or both.

Model 2: Political Patronage

In this model, the incumbent rewards his base of support through preferential allocation of projects. For example, he might care much more about his home district or districts with which he has ethnic or religious ties. He might also need to maintain alliances to remain in power. To model the preferential treatment of districts, let $\pi_i \geq 0$ be the weight *I*, the incumbent, places on district i based on past support and $\Sigma\pi_i=1$.

$$\begin{aligned} &\underset{p_i|_{i=1}^{L}}{\text{Max}} \ \Sigma_i \ \pi_i \ U(p_i) \\ &\text{s.t. } \Sigma_i \ p_i \leq P \end{aligned} \tag{3}$$

The first order conditions imply that for $\pi_i, \pi_j >0$
$\pi_i \ U'(p_i) = \pi_j \ U'(p_j)$ for all i, j

Thus projects go disproportionately to the districts of those that help the incumbent remain in power. One could imagine a case in which $\pi_i =0$ for the majority of the districts and projects are distributed among the few favored districts.

Model 3: Vote Buying in a Common Agency Framework

While the first two models did not consider that the incumbent might seek to win reelection, the third model introduces election concerns to examine their effects on public goods provision. Mobarak et al. (2004) and Foster and Rosenzweig (2001) use two party voting competition models in Brazil and India respectively to study public goods allocation. However, these models typically assume that parties make binding promises prior to an election in order to win votes. The model developed here instead assumes incumbent politicians spend prior to an election to increase their chances of winning. There is a fair amount of empirical evidence supporting increased government spending both in developed and developing countries in the run-up to an

election (Rogoff 1990). Political budget cycles are difficult to model because the voter cannot be bound to vote for the incumbent who spends in his district and a rational voter will see through an attempt at pure vote buying. Several signaling models have emerged to rationalize this kind of voter behavior by assuming that the spending signals the efficiency or competency of the incumbent (Rogoff 1990, Rogoff and Sibert 1988).

In Model 3, I present an alternative to constructing binding commitments between individual voters and national politicians by focusing on the relationship between local and national leaders using a common agency framework. Local leaders promise to deliver votes to the incumbent in return for projects. A common agency model is appealing on several levels. First, it seems to reflect an actual occurrence in many democracies. In the U.S., for example, it is not uncommon for a state governor to make a public promise to "deliver" his state to his party's presidential candidate. Second, the common agency model avoids unappealing assumptions about an individual voter's reaction to public investment placement or the mechanism that allows or commits national leaders to carry out promises to voters. Local and national leaders are more directly bound to each other through expectations of future mutual support and the potential retribution for reneging on promises. By an intuitive application of the folk theorem, local leaders can credibly commit future votes in exchange for current project funding.

Common agency models are frequently used to explain special interest group contributions to a politician. The politician is the common agent, and the special interest groups try to affect policy through their contributions. Grossman and Helpman (1996) and Baron (1994) both develop special interest group models in the context of elections. Model 3 draws on a simplified version of those models, as well as Persson and Tabellini (2000), as its starting point.

District leaders are the principals, promising votes instead of monetary contributions in return for a project in their districts. I do not specify exactly how the leader delivers these votes, but one could imagine several scenarios. For instance, the local leader could campaign for the national leader, use his influence to get voters to the polls, or commit fraud. The district leader's actions do not affect all voters equally. The votes of those who would have voted for the incumbent anyway are unchanged, and those heavily biased against the incumbent will not be swayed. I assume that each leader faces a district-specific cost of delivering votes.

The intuitive explanation of the outcome of this model is that leaders in districts with more swing voters will be able to deliver the most additional votes, while those in districts with strong biases for or against the national leader will not have much to contribute. The national leader faces a budget constraint and allocates projects to districts with the highest return in terms of additional votes in the next election.

The set-up: Prior to a national (presidential) election, the president decides how to allocate discretionary funds for certain projects across districts. District leaders compete for scarce projects and promise to deliver votes in return for projects. The election is held and the candidate with the most votes wins.

Voters: Although the voters have a somewhat passive role in this game, it is still necessary to explain their voting behavior. The model assumes that voters in each district share a common utility of the public good. Each voter also has an individual-specific bias. Voters vote for the incumbent national leader, *I*, if their expected utility from keeping him in office is greater than their biases against him.[2] Voter j in district i votes *I* if $V_i + h_i e_i - \delta_j > \sigma_{ij}$, where V_i is the district specific expected utility, δ is the voter's view on a national issue, and σ_{ij} is the district-specific bias. Both δ and σ are unknown to the leaders, but the distributions of these parameters are common knowledge. The term $h_i e_i$ will be crucial to the analysis and resembles set-ups in some campaign contribution models. e_i is the effort expended by the local leader campaigning for *I*. $h_i > 0$ is the "convincibility" of voters, and is assumed to be a function of the bias, b_i, and the leader's skill. Specifically, $h(|b|)$ is decreasing in the absolute value of the bias—reflecting the fact that biased voters are unlikely to change their minds. Thus, if voters are adamantly opposed to *I* ex-ante, h_i will be low. Likewise, if most voters in the district already support *I*, there will be few votes to be gained and h_i will be low. Voters with no bias ($b_i=0$) are most easily convinced to change their positions.

Let σ be uniformly distributed on $[(-1+2b_i)/2\phi_i, (1+2b_i)/2\phi_i]$, where ϕ_i is the district-specific density.[3] Then the fraction of voters in district i voting *I* is

$$s_i = \tfrac{1}{2} - b_i + \phi_i[V_i + h_i e_i - \delta]$$

Given otherwise identical districts, if the density, or clustering, of voter beliefs is higher in district x than in district y, then there will be fewer voters out on the tail of the distribution in x to vote against *I*. In other words, greater homogeneity of voters in a district benefits the incumbent as long as, excluding bias, they have a positive view of the incumbent, $[V_i + h_i e_i - \delta] > 0$.

Let s be the fraction of voters in the entire population voting for *I*, then

$$s=\Sigma N_i/N \; s_i = \tfrac{1}{2} + \Sigma N_i/N[- b_i + \phi_i [V_i + h_i e_i - \delta]]$$

[2] Because the opposing candidates do not have an active role in this model, I abstract from their effect. V can also be thought of as the difference in the expected utility of having N in office minus the expected utility of having the opponent in office.

[3] The bias parameter, b_i, can be positive or negative, implying that σ_{ij} can also be negative. A negative σ_{ij} should be interpreted as a positive view of the incumbent.

If δ, voters' view on a national issue, is distributed uniformly [- ½ ω, ½ ω] with density ω, and α is the probability that $s \geq ½$, i.e., the probability that *I* wins, then

$$\alpha = ½ + \omega/\phi \, \Sigma \, N_i/N \, [- b_i + \phi_i \, [V_i + h_i e_i - \delta]]$$

where $\phi = \Sigma(N_i/N) \, \phi_i$, the average density of voters.

District Leader: The district leader is willing to put effort, e_i, into campaigning for *I* as long as his utility, $H(p_i)$, from the project minus his efforts is non-negative. H is increasing and concave in p_i. The leader could be a social-welfare maximizer in his district, or p could help him solidify his hold on power. His problem is:

$$\underset{e_i}{\text{Max}} \; [H(p_i) - e_i \, , \, 0]$$

National leader: The incumbent politician seeks only to maximize his probability of winning and extracts rents R from being in office. He has P dollars available in his budget to spend on projects. He only affects the vote share through convincing local leaders to expend effort on his behalf, thus the constraint $e_i \leq H(p_i)$ is necessary to ensure that district leaders agree.

$$\begin{aligned} &\underset{p_i|_{i=1}^{L}}{\text{Max}} \; \alpha \, R \\ &\text{s.t. } \Sigma \, p_i \leq P \\ &e_i \leq H(p_i) \text{ for all i} \end{aligned} \tag{4}$$

Equilibrium: In this model, *I* has the power advantage over local leaders. Given a small budget and a large number of districts that do not vary greatly in size, *I* chooses the amount he spends in each district and the effort he demands from the district leader in return. Thus in equilibrium, *I* extracts all of the surplus from the district leaders who get projects, implying that $e_i = H(p_i)$. The maximization problem becomes:

$$\begin{aligned} &\underset{p_i|_{i=1}^{L}}{\text{Max}} \; \{½ + \omega/\phi \, \Sigma \, N_i/N \, [- b_i + \phi_i \, [V_i + h_i H(p_i) - \delta]]\} R \\ &\text{s.t. } \Sigma \, p_i \leq P \end{aligned} \tag{5}$$

The first order condition implies,

$$\omega/\phi \, \Sigma \, N_i/N \, [\phi_i \, [h_i H'(p_i)]] R = \lambda \quad \text{for all i}$$

Thus the incumbent politician will spend more in districts with higher populations, higher than average density of voter bias, higher convincibility of voters, and greater payoffs for local leaders (reflecting their greater willingness to work for *I*'s re-election).

3. Background

By almost any measure, Madagascar is one of the poorest countries in the world. According to the World Bank (2003), Madagascar ranks 189th out of 208 countries in terms of gross national income (GNI), 201st using purchasing power parity methods, and near the bottom in terms of infant mortality rates. Poverty is largely a rural phenomenon in Madagascar. Rural poverty rates increased in the late 1990s, while these rates fell for urban areas. More than 75 percent of rural residents are considered poor, compared to 50 percent for urban residents. Poverty rates in the most remote areas exceed 80 percent (World Bank 2001).

Madagascar is among the group of Highly Indebted Poor Countries (HIPC) slated for partial debt relief, with an outstanding debt of about $2 billion compared to the 2001 GDP of 4.6 billion. A large proportion of the government's annual budget comes from donors and lending institutions and the country receives approximately $33 in foreign aid per capita, equivalent to about 13 percent of GNI per capita. The budget deficit (including donor funds) for 2001 was estimated at 3.2 percent of GDP (World Bank 2002).

Public goods and services in Madagascar are severely restricted by the lack of government revenue, the daunting lack of infrastructure and the deterioration of existing infrastructure. In 1999 primary school enrollment rates across relevant age groups averaged 56 percent for the lowest income quintiles and 82 percent for the highest. This gap is even more striking for secondary school enrollment; only 4 percent of the poorest secondary school-age children attend school compared to 34 percent in the highest quintile (World Bank 2001). The deteriorating paved road network currently only links six major cities, and the provincial capital of Antsiranana and the southern port city of Fort Dauphin are each nearly a week of travel away from the capital in the dry season and almost completely cut-off from the rest of the country in the rainy season.

One of the three stated objectives in the government's poverty reduction strategy is the development of essential basic services (Government of Madagascar 2001). The declared emphasis is on significantly reducing poverty and closing the gap between the rich and poor, urban and rural areas, and between regions with regard to the access to public services. The government does have limited funds (from donors) earmarked for various infrastructure projects and has varying degrees of control over where those projects are located.

Madagascar is considered a relatively peaceful country with almost no ethnic violence in recent years. The people share a strong national identity and a common language, Malagasy. However, as almost everywhere else in the world, group identification still matters. One of the most important political features in Madagascar is the distinction between the central highlands and the coastal areas. The Merina, the major ethnic group in the highlands, have been the most powerful ethnic group in Madagascar for

over 200 years. They conquered the coastal regions and ruled the country from the early 19th century until French colonization in 1896. The largest and most well educated group, they are still by far the dominant economic force today. Many of the other ethnic groups remain wary of political domination by the Merina. Figure 1 shows the six provinces and the predominant ethnic group in each commune, the nation's smallest political administrative unit roughly equivalent to a county in the United States. Ethnicity is a sensitive issue in Madagascar, with some insisting that ethnic characterizations are irrelevant and that socio-economic disparities explain most political differences.

Madagascar has a republican constitution, with the popularly elected president serving a five-year term. A candidate must receive more than 50 percent of the vote in the election to win the presidency. If no candidate wins a majority, a run-off is held between the two candidates with the greatest number of votes in the first round. The constitution was adopted in 1992 when Didier Ratsiraka, who had taken power in a Marxist military coup, was forced to step down and hold elections after seventeen years in power.[4] In 1993 Albert Zafy became the first democratically elected president of Madagascar. Although Zafy was from the northern coast, he was supported by the Merina. Elected to a five-year term, Zafy was impeached in 1996 under allegations of money laundering, and early elections were held. Didier Ratsiraka was elected president and returned to power with narrow a majority of the vote in the second round of elections.

The most recent presidential election was held in December 2001, with Ratsiraka attempting to remain in power. Ratsiraka's strongest support has traditionally come from his native province of Toamasina, on the east coast. The popular mayor of the capital, Marc Ravalomanana, emerged as the main opposition candidate. As an ethnic Merina, Ravalomanana was not initially seen as a plausible candidate outside of the highlands, particularly in rural areas (Donovan 2002). As a self-made wealthy businessman, Ravalomanana was able to make himself known first by association with his nationally distributed food products, and second by his ability to campaign throughout the country (even in remote areas) with his personal helicopter.

The first round of the election did not officially produce a majority winner, with initial results giving Ravalomanana 46 percent and Ratsiraka 41 percent. However, Ravalomanana supporters contested the results and claimed a first round victory, and massive strikes and protests took place in the capital and around the country. The High Constitutional Court ordered a recount in April 2002, and Ravalomanana was declared the outright winner with 51.5 % of the votes. Ratsiraka refused to concede

[4] The Ratsiraka regime was arguably different from other neopatrimonial regimes in that opposition political parties existed and contested local elections took place. There was a relatively free private written press although radio and television were government owned (Andriantsoa et al. 2004). In terms of economic mismanagement, however, the Ratsiraka regime was very similar to others in Africa. Near total economic collapse finally forced Ratsiraka to allow economic and political reform, including a new constitution and presidential elections.

the election, declared Toamasina the new capital and attempted to rule from there. The economy—already suffering from months of strikes and uncertainty—ground to a halt as road blockades prevented fuel and other goods from reaching Antananarivo. Ravalomanana was officially sworn in in May 2002, but it wasn't until July when Ratsiraka fled the country that stability returned (Marshall and Jaggers 2002). An estimated 70 people were killed during the crisis, but the army generally remained neutral (Somerville 2002). Reflecting the large economic impact of the crisis, GDP fell by nearly 12 percent in 2002 after growing 4 percent in 2000 and 6 percent in 2001 (World Bank 2003).

4. The Data

This study uses four data sources. The 1993 population census is the most recent government census currently available in Madagascar. Information from this census includes population figures by gender and various age groups, literacy and schooling rates, employment figures, and percent of the population with access to services such as electricity and running water. The second source of data is the poverty map of Madagascar. The World Bank (Mistiaen, et al. 2002) generated the spatially disaggregated poverty and inequality estimates by combining information from a large household survey conducted in 1993 and the population census in order to estimate poverty measures by commune. The data set includes mean income of the commune, the proportion of the commune's population living in poverty (also known as the headcount ratio or FGT0), the depth of poverty (FGT1) and gini coefficients.

The 2001 commune census was conducted in collaboration between Cornell University and the Malagasy agricultural research institute (FOFIFA) over a three-month period in 2001 ending six weeks prior to the presidential election. The survey was conducted at the commune's administrative center. A total of 1385 communes were surveyed, all but 9 currently functioning communes. The remoteness of some communes and the general lack of national data on certain subjects meant that little was known about the spatial distribution of public goods and services, prices, or economic activity prior to this study. Most of the commune census questions, such as those concerning local prices, transportation, access to various goods and services, major economic activities, ethnic groups, and community perceptions of existing conditions, were answered by a focus group composed of residents of the commune.

Public investment spending figures by commune do not exist in Madagascar, reflecting the large amount of donor funds flowing through different ministries and at different levels of government. However, the commune census includes several types of public investment occurring between the 1996 and 2001 elections that provide useful proxies for p_i in the models presented earlier. Among these are: the placement of health clinics or schools, where they had not existed previously, the number of new

public administrative buildings built in 2000, and the presence of a World Bank funded infrastructure development project.[5]

For a number of public services, such as elementary and secondary schools, hospitals and clinics, roads, and electricity and water service, the commune census data provides the year the service was first provided (if ever), but not the amount or number provided or whether the service had been increased or improved since its introduction. Because of this data limitation, the analysis is limited to those communes that did not yet have the service in 1996 (the year Ratsiraka was returned to power). Table 1 summarizes the number of communes receiving access to selected services during the 1996-2001 budget cycle. Because nearly 90 percent of communes without clinics report receiving one over the period, the lack of variability makes explaining this allocation difficult. Extension of electricity service is highly dependent on being near a power source or another commune with service, and only a further 3 percent of communes gained service over the 1996-2001 period. For these reasons, these services are not included in the estimations in Section V.

The commune census also included a question on new public (administrative) buildings, and while it is arguable whether such investment has a direct effect on poverty, they clearly do facilitate the government's overall ability to do its job. Approximately half of the communes reported that a new public building was constructed in 2000.

FID (*Fonds d'Intervention pour le Developpement*) was a World Bank funded project primarily concerned with "construction and rehabilitation of basic infrastructure, including schools, health centers, water supply, small irrigation systems, rural roads, small bridges, as well as reforestation and protection of the environment" (World Bank 2000). The project proposal had to come from the commune, but was subject to approval at the national level. While the projects were designed and managed outside of central government control, the final report concluded that they "cannot be completely isolated from political influence." The report also mentions political interference and infighting. Further evidence that the government influenced and took direct credit for projects is provided by the commune census, in which nearly 83 percent of communes with a FID project identified FID as a government program, and not as a program of a donor organization. Table 2 reports the percent of communes reporting construction of at least one new building and the percent of communes receiving FID projects.

[5] The Commune census does not provide information on the relative size or value of the project in the commune. While the value of FID projects was capped at a set maximum and should thus be fairly uniform in value across communes, the value of public administrative buildings is likely highly variable. For example, one would expect that a new building in the capital would be much larger and more costly than one in a small rural district that has neither electricity nor running water. Secondary schools could vary by amenities (such as sports facilities) and by expected student population, but I am unable to control for these potential differences.

The 2001 election results of the High Constitutional Court are publicly available from the Madagascar consortium of election observers (*Consortium des observateurs des elections 2002*). Because the voting records are provided by polling place and only the name of the commune (district) where the polling place was located was given, I was able to match only 1199 out of 1394 communes.[6] The data include the numbers of voters voting for each candidate and the total number voting. Although six candidates ran in the election, Marc Ravalomanana emerged as the only credible challenger. Table 4 summarizes the commune-level election results for Ratsiraka and Ravalomanana by province and Figure 2 shows the proportion of voters voting for Ratsiraka. There is a great deal of variation between communes. The percentage of voters voting for Ratsiraka ranged from 2 to 99 percent, while for Ravalomanana the range was 0 to 89 percent. As we might expect, Ratsiraka did the best in his home province of Toamasina and worst in Ravalomanana's home province of Antananarivo. However, the within-province variation is still quite large.

The province differences in the vote share going to the two major candidates provide some evidence that ethnic group affiliation might play a role in voting behavior. To further demonstrate the role of ethnic or group identities, Table 4 shows simple regressions of the proportion of voters voting for Ratsiraka (a Betsimisaraka) and for Ravalomanana (a Merina) on the estimated proportion of a district's population in various ethnic groups, as reported in the commune census. While these regressions are overly simplistic and ignore intra-group and regional socio-economic differences, they are quite revealing. The ethnic groups alone explain 31 (41) percent of the variation in vote shares for Ratsiraka (Ravalomanana). Merina and Tsimihety dominated areas were much more likely to vote for Ravalomanana and less likely to vote for Ratsiraka, while the Betsimisaraka, Antanefasy, and Antandroy areas were much more likely to vote for Ratsiraka and less likely to vote for Ravalomanana. The communes with a greater proportion of the Sakalava tended to vote for the ex-president Albert Zafy. The Bara are the only group with no significant effect on the vote shares for either candidate—a finding that is consistent with the fact that this southern pastoralist group is culturally distinct, politically and economically marginalized, and identifies with neither the coastal nor the high plateau groups.

5. Public Goods Allocation

This section explores empirically the factors that influenced the location of projects in Madagascar prior to the 2001 presidential election. The three models of spending allocation presented in Section II provide some simple hypotheses to test. If p_i is a dummy or count variable indicating that a project was placed in district i, $p_i = f(W_i, B_i, E_i)$, where W are the welfare or need variables, B are the political base variables, and

[6] Voting records from several communes in Toliara province were not among the consortium results. In addition, the difficulty in matching the voting records to communes results from the fact that commune names are not unique and different spellings and even names are sometimes used for the same commune. The results from the remaining data give 36 percent of the vote to Ratsiraka and 48 percent to Ravalomanana.

E are the election variables. Table 5 describes the variables. The population characteristics and existing infrastructure variables can loosely be considered the W variables (except for population, which factors into the election model as well), the information access variables fall into the election category, and the ethnic variables capture both the political base and the election concern variables.

From model 1, the null hypothesis of no social welfare maximization behavior in the decision-making process implies that $\beta_W = 0$, where need is measured by population, poverty, education, health and existing infrastructure variables. The null hypothesis of pure social welfare maximization is that all other coefficients (such as ethnicity and information access) $\beta_B = \beta_E = 0$. From model 2, the model of political patronage, the null hypothesis of no political patronage in the decision-making process implies: $\beta_B = 0$, where the base variables are captured by ethnic groups from the district. The test of pure political patronage is equivalent to $\beta_W = \beta_E = 0$ since the incumbent spends only according to ethnic and political ties.

From the vote maximization model (model 3) with the politician as common agent, the null hypothesis of no political vote-buying in the decision-making process is $\beta_E = 0$, where the election variables are captured by the estimated numbers of swing voters in a district, local access to information, and the political experience of the local leader. The test of pure vote buying is equivalent to $\beta_W = \beta_B = 0$ since the incumbent spends only to gain votes.

The first challenge in the estimation is to find a measure of swing voters. One approach is to simply use the data on the major ethnic groups in a commune. Based on historical trends and relationships, I loosely classify groups into those biased towards Ratsiraka, against Ratsiraka, or somewhere in between. For example, the highland groups, the Merina and the Betsileo, tend to be against Ratsiraka, and the Betsimisaraka and Antandroy tend to be his base of support. The northern Tsimihety and Antakarana will tend to vote against Ratsiraka. The latter group's opposition can be explained by the fact that the former president Zafy is Antakarana and was also running in the 2001 election. I will assume the other major groups, the Bara, the Sakalava, and the southeastern groups, are less biased and fall into the swing category. The groups from the north (Tsimihety and Antakarana) and southeast (Antemoro, Antefasy, Antesaka, and Antanosy) are each combined to form two categories.

Another approach is to use the data from the 2001 election. In a study of discretionary spending and elections in Canada, Milligan and Smart (2003) try two different measures of swing voters—both based on the percentage (or expected percentage) vote difference between the two major parties using data from previous elections. Milligan and Smart study the case of parties trying to maximize the number of seats in a legislature, and thus the focus is on swing districts and the "closeness" of the race in a single district. Because the present paper is concerned with a popular election, the total number of swing voters in a district matters, while winning a single district does not. According to the common agency model, projects should go to the districts with

the most voters who are "convincible." These districts will not have skewed distributions of voters biased heavily in either direction.

I construct a measure of voting polarization using the absolute value of the deviation of the predicted vote share for the incumbent from 50 percent of the commune's electorate. This number is then multiplied by the voting age population to get the estimated number of polarized voters. In other words, voting polarization, z_i, in commune/district i is, $z_i = (|0.50 - \hat{s}_i| * N^v_i)$, where $\hat{s}_i$ is the predicted vote share, and N^v_i is the voting age population. The predicted vote share is used because the actual share will be endogenous if voters respond to the location of projects in their districts. Instruments such as local prices and security conditions, which would not affect project allocation, are used to identify the prediction model. The instrumenting equation is presented in the appendix. The resulting voter polarization variable should have a negative effect on project allocation. The more skewed the electorate in the district and the fewer numbers of swing voters, the less likely voters are to be swayed. [7]

The three competing models of national decision-making are tested for each of the three types of public goods allocations described earlier: FID projects, new public buildings, and the location of new secondary schools. Table 6 uses only the ethnic variables to proxy for the numbers of swing and biased voters. Table 7 presents the estimation results for the same three public goods, but includes the instrumented voting polarization variable. The standard errors in Table 7 were produced by bootstrapping with 1,000 replications. Following Horowitz (2001), the small sample bias-corrected coefficient estimates are also computed and included in the table.[8] The Table 7 results are largely consistent with those in the first estimation, except that the standard errors from bootstrapping are slightly larger.

In the allocation of FID projects, the only "needs" type criteria that are statistically significant are the population of the commune and whether there was already a school or health clinic in 1996. The effect of population is small relative to the other two public goods allocation. The positive effect of having a school on FID reflects the fact that that some FID projects rehabilitated schools, and the negative sign on the clinic variable is what one would expect if the communities with the greatest need were given projects. Areas with low population densities were more likely to receive projects.

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[7] If one imagines a continuum of voters ranging from completely for to completely against the incumbent, then the difference between votes only captures the middle voters if this distribution is unimodal. In other words, if you had roughly equal numbers of voters in a district for and against the incumbent, then the difference in the votes would be zero although there were no swing voters. With this caveat in mind, I use this measure of voting polarization.

[8] If the coefficient estimate θ is biased because of finite sample bias, B, then $\theta + B = \theta^*$, where θ^* is the underlying population coefficient. Horowitz (2001) shows that the mean of the coefficients derived from the bootstrap replications is equal to $E(\theta^*)$. Thus the $B = E(\theta^*) - \theta$, and the unbiased coefficient estimate is $2\theta - E(\theta^*)$.

FID projects were statistically significantly more likely to be located in areas with an experienced mayor (although the magnitude of the coefficient is small), suggesting that understanding how to access the central government and having connections help secure public goods for a district. The relatively large positive effects of radio and television reception may have more to do with the access of the local government to information on the projects and how to apply for them than with the population's access to information concerning the election.

Consistent with the Model 2 hypothesis that the incumbent is rewarding his political base, projects were less likely to be located in Merina dominated areas and more likely in Betsimisaraka and Antandroy areas. They were also much more likely in areas with larger numbers of Sakalava, northern groups and southeastern groups—findings more consistent with the Model 3 hypothesis concerning swing groups. The voting polarization variable does not have a significant effect on project allocation. Joint tests of the relevant coefficients reject the hypothesis of no patronage or vote buying. If only the population characteristics are used, the hypothesis of no needs-based decision-making cannot be rejected. However, the hypothesis is rejected if the existing infrastructure variables are included in the test.

To analyze the allocation of new public buildings, a poisson (count data) model is used since approximately one-half of the districts with new public buildings in 2001 received more than one building. Consistent with needs-based allocation, new buildings tend to be allocated to districts with higher population density and higher population, as well as to areas that experienced damage from cyclones since 1998. The province dummies are statistically significant with relatively large coefficients and the positive coefficients indicate that areas outside the highland province of Antananarivo were more likely to receive new buildings. Merina areas and southeastern groups were more likely, and northern groups less likely, to receive new buildings in the Table 7 estimation. The voting polarization variable is positive and significant. Although the vote-buying model predicted a negative relationship, the positive sign would seem to lend support to the patronage model because it demonstrates that projects tended to be allocated to biased districts.[9] The joint test that the population and existing infrastructure variables have no effect on public building allocation is easily rejected, lending support for some needs-based criteria. The test that the political, information and ethnic variables jointly have no effect on decision making is rejected.

The analysis of new secondary school location is limited to the 599 communes that did not have the service prior to 1996. Secondary schools are much less likely to be located in higher population areas and more likely in areas of higher literacy. This

[9] To test whether direction of the bias mattered, an interaction term between the polarization variable and the sign of the bias was included in the estimation. This variable was not significant, indicating that projects were going to groups biased both for and against the incumbent. This result could be explained by an alternative view of the patronage model in which politicians funnel projects not only to supporters but also to opposition groups in order to quiet them.

latter result is intuitive since these areas will have a higher demand for secondary schools. Schools were more likely to be built in areas with electricity, and in areas with cyclone damage or former colonial administrative presence. None of regional dummies or ethnic group variables had a significant effect. Joint tests reject the hypothesis of no needs-based allocation and fail to reject the hypothesis that the political, information, and ethnic variables jointly have no effect.

Based on the analysis of the allocation of three public goods across districts, there is limited evidence in the data to support needs-based allocation, but no evidence to support the poverty minimization allocation, as indicated by the lack of significance of the poverty rate in the estimations. Although the FID projects were supposed to be designed and managed outside of the government (World Bank 2000), this project was the most vulnerable to political influence. There is some evidence supporting both the patronage and vote buying models in FID allocation. Furthermore, the importance of having an experienced leader and access to television and radio in the allocation of FID projects does support the incumbent-as-common agent model. Those with access to information and decision-makers at the national level are more likely to get projects. There is no evidence to support either the patronage or vote buying models in the allocation of new schools, while the allocation of new buildings lends some support to the patronage model.

6. The 2001 Election and Voter Behavior

The previous section looked at the effect of the impending election of the location of projects, and this section examines the effect of projects on the election. While section II presented a very simply model of voter behavior, a more detailed discussion is warranted. The model held that a voter votes for *I* if $V_{i+} h_i e_i - \delta \geq \sigma_{ij}$. Vote shares should increase in districts with a project, through the campaigning work of the local leaders described earlier. It is also possible that the local leaders' ability and credibility affect h_i. Districts populated with groups biased for (against) the incumbent will vote overwhelmingly for (against) him.

The voter derives his expected utility from keeping *I* in office based largely on his perceived job performance, including current conditions in the district and the voters' perceptions of whether these conditions have been improving or deteriorating under the incumbent's watch. Thus, new public goods provision should rationally enter into voters' decisions. If the incumbent is placing projects purely based on need (i.e. doing a good job) then the voter will view this favorably. If, however, the voter sees the allocation as a one-time vote-buying attempt, it should have no effect on his decision. Media access could also enter into the voter's decision as districts with better access to media will likely be better informed on national issues.

Table 8 presents two sets of estimation results. The first excludes the spending allocation variables and the second includes the instrumented new buildings and FID. I exclude the information on the secondary schools constructed since 1996 from the

analysis since these are limited to a subset of communes. The dependent variable is the number of votes for Ratsiraka, and this is regressed on the number of voters and other commune characteristics. Because voter turnout might be affected by the same unobservables as the voting decision, the number of voters is endogenous.[10] The voting age population and the number of polling stations per commune are used as instruments in a 2SLS regression. The dummy variables for French presence during the colonial period (a proxy for existing infrastructure), cyclones, and whether the center of the commune was created after 1980 are used as instruments for FID and new buildings. The instrumenting equations are provided in the appendix. Both the number of voters and spending variables were tested for endogeneity, using a Hausman test (Wooldridge 2002). The tests fail to reject the null hypotheses of endogeneity in each case.

Higher literacy rates and higher inequality are associated with fewer people voting for Ratsiraka. Areas with high concentrations of Betsimisaraka were more like to vote for Ratsiraka, while the northern groups were less likely to vote for him. It is interesting to note that once other commune characteristics are included, the effect of the other ethnic groups (compared to the Table 4 regression) largely disappears. The regional dummies have large and significant effects on voting patterns; relative to Antananarivo, all other provinces were more likely to vote for Ratsiraka.

Crime is a major problem in some rural areas of Madagascar (Fafchamps and Moser 2003), and this is reflected here in voters' desire for political change where crime and insecurity are considered high. Rice is the staple commodity in Madagascar and its price has large impacts on both producers and consumers, and thus the high variability in the rice price also had a negative effect on the vote. Voters at a greater distance from a major city were less likely to vote for Ratsiraka—a finding at odds with the perception that the rural areas would support the incumbent. In the second estimation, FID projects and the number of new public buildings had no significant effect on the number of votes.

Regional and ethnic ties weigh heavily in voter decisions in Madagascar, possibly reflecting remnants of Ratsiraka's patronage system or deeper historical relationships. Despite the highly polarized electorate, voters do still respond to local conditions. High inequality, crime, and price fluctuation, as well as the lack of access to secondary schools in some areas hurt Ratsiraka's reelection bid. While voters did not respond to FID projects or the number of new public buildings, the ability of the government to improve the lives of the people and deliver services over a longer period does have an effect on the outcome of elections.

[10] Mobarak et al. (2004) in fact find that counties with higher voter participation rates in Brazil received more health care services.

7. Politically motivated deviations from poverty reduction goals

While the Section V found some evidence to support each of the three models of public goods allocation, the analysis does not tell us anything about the implications of these allocation decisions. Is vote-maximization behavior better or worse than political patronage? How does the actual allocation compare and which model does it most closely resemble? Few would argue or expect public goods allocation to be purely based on need—even in a developed democracy. Nevertheless, needs-based criteria serve as a good benchmark for the purpose of evaluation. The present section examines how the actual, pure vote-maximization and pure patronage allocations differ from a poverty minimization strategy using FID projects, new schools, and new clinics. The hypothetical allocations presented below assign the same number of projects actually allocated according to three different criteria— poverty minimization, patronage, and vote-maximization.

The poverty minimization strategy ranks communes by the number of people living in poverty, i.e. fgt0* population. The n communes with the largest number of poor would then be allocated projects, where n corresponds to the actual number of projects. However, this strategy ignores the severity of poverty, and one might argue that targeting the poorest of the poor should be the top priority.[11] Thus the communes are also ranked by poverty depth, also known as the fgt1 measure. The patronage ranking relies on the observation that neopatrimonial regimes have often used public sector employment to reward friendly groups and to quiet opposition (Gibson 2003). The top n communes are allocated hypothetical projects by the total number of public sector employees.

For the vote-maximization allocation, it is necessary to identify the communes that would have garnered the most votes if a project had been allocated prior to the 2001 election in Madagascar. The number of votes for the incumbent are regressed on commune characteristics, the public goods dummy, and interaction terms between the public goods dummy and ethnic characteristics and radio and television access. Using the coefficients on these interaction terms multiplied by the variable levels (and letting the project dummy=1), the communes are then ranked based on the estimated marginal effect on votes of putting a project in the commune.

Table 9 compares the actual, patronage, and vote maximization allocations by the number of positive project matches they had with each of the two poverty rankings. For example, 46 percent of communes receiving projects under the poverty minimization strategy also received projects under the actual and vote maximization allocations. The patronage model tended to match the greatest number of projects under the poverty minimization strategy, while the actual and vote maximization allocations fared about the same. Under the poverty severity minimization strategy,

[11] In fact, the government's poverty reduction strategy does mention closing the gap between urban and rural areas, which would imply improving the lives of the poorest groups.

the actual allocation tended to have slightly more matches across the three project types.

Table 10 displays the correlation coefficients between the allocations. The actual allocation most closely resembles vote maximization and patronage models for FID projects—a finding consistent with the Section V estimation results. It is also more highly correlated with the patronage model than the others in the clinic and school allocations. Compared to the FID and building allocations, the actual school allocation is more highly correlated with the poverty and poverty severity minimization strategies.

This exercise underscores the apparent lack of poverty targeting in the actual allocation of projects despite of the government's stated objectives. This finding is consistent with the Section V results that poverty was not a significant factor in the allocation decisions. The actual allocations tend to resemble the hypothetical patronage and vote maximization strategies more closely than the poverty reduction strategies.

8. Conclusions

Using data from Madagascar, this paper has presented and tested three competing models of public goods allocation. The first model hypothesizes that the government allocates projects according to the relative needs of the districts. In the second model, the incumbent leader wishes only to reward his political base. In the third, the incumbent seeks only to get reelected and strategically allocates projects to maximize his probability of winning the election. This model presents a novel approach to political budget cycle theories by using a common agency framework in which a local leader promises to deliver votes in return for a project in his district.

Despite the government's stated priority of poverty reduction through the provision of basic services, poverty did not impact the allocation of the three project types studied here. While political and ethnic variables had no effect on the location of new schools, and only a limited effect on new buildings, FID projects seem to have been particularly vulnerable to political influence and display evidence of both patronage and vote-buying behavior. The importance of the local leader's political experience in the allocation of FID projects lends further support to the common agency model. Connections and access to national decision makers do matter for project allocation. This result does not seem to bode well for small, isolated districts with limited access to national government and outside information, and little capacity to lobby or apply for projects.

The results from the 2001 presidential election confirm that voters vote based largely on regional and ethnic ties. However, with a closely divided electorate, the swing voters do respond to local conditions—price variability, inequality, crime, and access to schools were particularly important in the 2001 election—and thus improving conditions and providing services should help the incumbent. Although this was only

Madagascar's third democratic presidential election, it has a lot in common with more developed democracies. The US is a prime example of a highly polarized electorate divided largely along regional and ethnic lines. Wealthy businessmen commonly run for office in the US and are often the only ones who seem to be able to challenge an entrenched incumbent, just as Ravalomanana was able to challenge Ratsiraka. And as in developed democracies, rhetoric on topics such as poverty reduction rarely translates into objective and direct targeting of the populations most in need.

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Table 1. Public Service Extension

Service	Number of Communes without the service in 1996	Number of Communes gaining access by 2001	Percent of Communes gaining access by 2001
Secondary School	626	90	14
Clinics or Hospital	378	315	89
Electricity	1038	33	3

Table 2. Percent of communes receiving FID project or new building

	Percent with new public building in 2000	Percent receiving FID project
All Provinces	49%	47%
Antananarivo	45%	28%
Fianarantsoa	57%	52%
Toamasina	51%	43%
Mahajanga	50%	54%
Toliara	40%	49%
Antsiranana	50%	71%

Table 3. 2001 Election Results by Province

	Incumbent (Ratsiraka)		Opponent (Ravalomanana)	
All Provinces N=1206	% of vote	No. of votes	% of vote	No. of votes
Mean	41%	1044	40%	1370
Standard deviation	18%	2347	17%	7942
Median	39%	666	40%	637
Minimum	2%	1	0%	0
Maximum	99%	72219	89%	268734
Antananarivo	N=261			
Mean	33%	1711	57%	3641
Stdev	12%	4616	12%	16762
Minimum	7%	83	25%	169
Maximum	68%	72219	82%	268734
Fianarantsoa	N=309			
Mean	40%	739	36%	731
Stdev	15%	765	14%	1076
Minimum	5%	5	2%	8
Maximum	89%	7739	73%	14738
Toamasina	N=162			
Mean	64%	1536	26%	802
Stdev	19%	1220	15%	1169
Minimum	11%	20	0%	0
Maximum	99%	7895	75%	7039
Mahajanga	N=191			
Mean	35%	756	45%	990
Stdev	15%	1096	13%	1561
Minimum	5%	5	9%	16
Maximum	71%	14147	89%	20611
Toliara	N=187			
Mean	42%	558	33%	455
Stdev	15%	518	13%	500
Minimum	2%	1	7%	18
Maximum	76%	3113	82%	3616
Antsiranana	N=96			
Mean	38%	898	30%	747
Stdev	11%	1277	9%	1129
Minimum	15%	43	7%	14
Maximum	66%	10652	47%	10138

Table 4. Regression of vote shares on ethnic group composition

	Ratsiraka (proportion voting for) R^2=.31		**Ravalomanana** (proportion voting for) R^2=.41	
Propotion of population:	Coeff.	t-stat	Coeff.	t-stat
Merina	-0.0008	-5.67	0.0019	16.34
Betsileo	-0.0002	-1.19	0.0005	3.15
Sakalava	-0.0006	-2.08	-0.0004	-1.60
Betsimi	0.0026	15.76	-0.0019	-13.09
Antandroy	0.0011	3.90	-0.0014	-5.67
Tsimihety	-0.0014	-6.87	0.0007	4.14
Bara	0.0003	0.86	-0.0004	-1.39
Antanefasy	0.0034	5.25	-0.0031	-5.31
Antesaka	-0.0006	-2.11	-0.0014	-5.68
Antakarana	-0.0002	-0.34	-0.0012	-2.14
Constant	0.4087	51.51	0.3857	55.13

Table 5. Description of variables

Public Spending Allocation	**Variable description** (data from commune census unless otherwise noted)	**Mean**	**Std. dev.**
FID	Dummy=1 if commune had a FID project	0.475	0.500
New public buildings	Number of new public buildings constructed in 2000.	1.199	2.491
New secondary school	Dummy=1 if commune received a new secondary school since 1996.	0.075	0.263
Population Characteristics			
Poverty rate (FGT)	Proportion of the commune population living in poverty, 1993 poverty map.	0.736	0.138
Population density	Number of inhabitants per square km, 1993 census.	100	422
Infant mortality rate	Infant mortality rate, 1993 census.	.145	.059
Literacy rate	Percent of adults literate, 1993 census.	58	23
Population	Population of commune, 1993 census.	8,984	21,617
Existing Infrastructure			
Clinic in 1996	Dummy=1 if commune had a clinic or hospital in 1996.	0.619	0.486
School in 1996	Dummy=1 if commune had a clinic or hospital in 1996.	0.426	0.495
Cyclone	Dummy=1 if a cyclone caused damage in commune between 1998 and 2001. Used as instrument for project variables in election estimation.	0.487	0.500
French presence	Dummy=1 if French were present in commune during colonial period. Used as instrument for project variables in election estimation.	0.413	0.493
Newly created town	Dummy=1 if commune center was formed since 1980. Used as instrument for project variables in election estimation.		
Political Base			
Mayor	Number of years in office of sitting Commune mayor in 2001. Used to proxy for ability of mayor to mobilize citizens.	3.483	2.502

Table 5. (continued)

Information Access			
Radio reception	Dummy=1 if commune has radio reception.	0.486	0.500
Television reception	Dummy=1 if commune has television reception.	0.326	0.469
Travel time to major city	Travel time to nearest major city in hours.	19	24
Local Conditons			
Average rice price 2001	Average of rice price (in Fmg) across 4 quarters in 2001.	625	129
Seasonal rice price variation	Change in rice price from lowest to highest across 4 quarters in 2001 (calculated as the min. price minus the max price divided by the min. price).	0.812	0.619
Crime and security	Index=1 if security and crime were not at all a problem, =5 if crime is a considered very bad.	2.931	0.937
Health compared to 1996	Index=1 if health of commune residents was thought to have improved since 1996, =5 if conditions worsened.	2.324	0.941
Income compared to 1996	Index=1 if income of commune residents was thought to have improved since 1996, =5 if conditions worsened.	2.843	1.150
Ethnic Groups	**Region of origin**	**% of commune population**	**St.Dev**
Merina	Highlands	16.97	35.47
Betsimisaraka	East coast	10.86	28.44
Betsileo	Highlands	8.89	26.34
Sakalava	Northwest	4.16	14.78
Antandroy	South	3.68	15.63
Bara	South	2.19	12.14
Tsimihety , Antakarana	North	8.13	23.78
Antemoro, Antefasy , Antesaka, Antanosy	Southeast coast	10.71	26.09

Table 6. Estimation results for project variables *

	FID (probit)		New building (poisson)		New school (probit)	
Population Characteristics	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**
Poverty rate (fgt0)	-0.116	-0.28	0.025	0.05	0.309	0.37
Population density (#/km^2)	0.0002	-1.52	**0.0001**	**3.78**	**-0.001**	**-2.10**
Infant mortality rate	-0.808	-0.92	-0.463	-0.38	-0.874	-0.58
Literacy rate (percent)	-0.001	-0.21	-0.003	-0.79	**0.020**	**3.77**
Population (Log)	**0.149**	**1.83**	**0.365**	**2.85**	**0.558**	**3.43**
Existing Infrastructure						
Clinic in 1996 (Dummy)	**-0.193**	**-2.13**	-0.073	-0.73	0.098	0.64
Electricity in 1996 (Dummy)	0.178	1.13	0.150	0.79	**1.031**	**2.71**
School in 1996 (Dummy)	**0.348**	**3.62**	0.091	0.78		
Cyclone (Dummy)	0.082	0.93	**0.416**	**3.95**	**0.322**	**2.08**
French (Dummy)	0.012	0.14	0.042	0.39	0.258	1.58
Political Base						
Mayor	**0.032**	**1.73**	-0.001	-0.03	-0.009	-0.32
Information Access						
Radio reception (Dummy)	**0.221**	**2.29**	0.026	0.25	-0.156	-0.85
Television reception (Dummy)	**0.238**	**2.09**	0.094	0.62	0.204	1.01
Travel time to major city (hrs)	-0.033	-0.83	-0.050	-1.1	-0.005	-0.08
Province Dummies (Antananarivo is omitted)						
Fianarantsoa	0.283	0.98	**0.861**	**2.53**	0.233	0.49
Toamasina	-0.124	-0.42	**1.002**	**3.45**	0.102	0.2
Mahajanga	0.433	1.42	**1.232**	**3.53**	0.377	0.75
Toliara	0.244	0.78	**0.617**	**1.74**	0.501	0.99
Antsiranana	0.488	1.47	**1.251**	**3.68**	-0.308	-0.48
Ethnic groups (log)						
Merina	**-0.052**	**-1.78**	**0.079**	**2.31**	-0.012	-0.24
Betsimisaraka	**0.040**	**2.01**	**0.052**	**2.82**	-0.039	-0.92
Betsileo	0.016	0.78	**0.057**	**1.72**	0.022	0.57
Sakalava	**0.041**	**2.04**	0.035	1.48	-0.056	-1.24
Antandroy	**0.057**	**2.09**	-0.005	-0.15	0.006	0.13
Bara	-0.012	-0.66	**0.066**	**2.24**	-0.019	-0.59
Northern groups	**0.055**	**2.09**	-0.016	-0.57	-0.034	-0.67
Southeastern groups	**0.038**	**1.89**	**0.081**	**3.05**	-0.029	-0.64
Constant	**-1.868**	**-2.26**	**-4.444**	**-3.52**	**-7.425**	**-4.25**
N	1053		1053		560	
R^2	0.11		0.11		0.22	
LL	-643		-1701		-181	

*Coefficients significant at the 10% level in bold

Table 7. Estimation results for project variables (including instrumented voting polarization variable)*

	FID (Estimator is probit)			Newbuild (Estimator is poisson)			New School (Estimator is probit)		
Population Characteristics	**Coeff.**	**Bias-corrected coeff.**	**t-stat**	**Coeff.**	**Bias-corrected coeff.**	**t-stat**	**Coeff.**	**Bias-corrected coeff.**	**t-stat**
Poverty rate (fgt0)	-0.101	-0.111	-0.24	0.284	0.280	0.56	0.165	0.029	0.17
Population density	0.0002	0.0002	-1.06	0.00008	0.00006	-0.44	-0.001	-0.001	-1.01
Infant mortality rate	-0.821	-0.844	-0.92	-0.426	-0.450	-0.36	-0.883	-0.759	-0.50
Literacy rate	-0.001	-0.001	-0.17	-0.003	-0.003	-0.62	**0.020**	**0.018**	**3.19**
Population	0.111	0.132	0.98	0.069	0.076	0.62	**0.682**	**0.618**	**2.38**
Existing Infrastructure									
Clinic in 1996	**-0.195**	**-0.187**	**-1.98**	-0.088	-0.083	-0.87	0.099	0.094	0.54
Electricity in 1996	0.170	0.170	1.01	0.129	0.110	0.63	**1.062**	**0.941**	**1.80**
School in 1996	**0.348**	**0.343**	**3.39**	0.145	0.159	1.24			
Cyclone	0.079	0.076	0.90	**0.391**	**0.404**	**3.68**	**0.333**	**0.291**	**1.76**
French	0.011	0.014	0.11	0.041	0.042	0.38	0.265	0.236	1.40
Political Base									
Mayor	**0.032**	**0.031**	**1.67**	0.005	0.006	0.25	-0.009	-0.005	-0.23
Voting polarization (instrumented)	0.00007	0.00001	0.49	**0.0003**	**0.0002**	**2.81**	0.0003	0.0002	-0.69
Information Access									
Radio reception	**0.225**	**0.212**	**2.19**	0.023	0.023	0.21	-0.182	-0.166	-0.85
Television reception	**0.242**	**0.235**	**2.07**	0.115	0.131	0.74	0.199	0.200	0.85
Travel time to major city (in hours)	-0.035	-0.031	-0.82	-0.063	-0.064	-1.29	-0.004	0.003	-0.05

Table 7. (continued)*

Province Dummies (Antananarivo is omitted)									
Fianarantsoa	0.302	0.284	0.98	**0.841**	**0.823**	**2.38**	0.145	0.137	0.25
Toamasina	-0.109	-0.108	-0.36	**0.951**	**0.958**	**2.96**	0.055	0.010	0.09
Mahajanga	0.455	0.416	1.35	**1.262**	**1.297**	**3.18**	0.252	0.225	0.38
Toliara	0.269	0.244	0.79	**0.708**	**0.715**	**1.81**	0.397	0.361	0.60
Antsiranana	0.511	0.482	1.43	**1.289**	**1.303**	**3.32**	-0.468	-0.499	-0.61
Ethnic groups (Log of estimated)									
Merina	**-0.052**	**-0.050**	**-1.68**	**0.061**	**0.062**	**1.80**	-0.010	-0.009	-0.16
Betsimisaraka	**0.039**	**0.037**	**1.90**	**0.058**	**0.059**	**2.92**	-0.035	-0.026	-0.67
Betsileo	0.016	0.016	0.71	**0.054**	**0.056**	**1.69**	0.028	0.027	0.59
Sakalava	**0.040**	**0.040**	**1.76**	0.028	0.028	1.12	-0.049	-0.039	-0.86
Antandroy	**0.058**	**0.056**	**1.99**	-0.009	-0.008	-0.28	0.007	0.008	0.12
Bara	-0.013	-0.014	-0.70	**0.039**	**0.038**	**1.82**	-0.019	-0.016	-0.49
Northern groups	**0.052**	**0.053**	**1.83**	-0.028	-0.030	-0.93	-0.017	-0.020	-0.25
Southeastern groups	**0.038**	**0.037**	**1.83**	**0.080**	**0.082**	**3.13**	-0.027	-0.024	-0.47
Constant	**-1.586**	**-1.704**	**-1.59**	**-2.111**	**-2.123**	**-1.89**	**-8.228**	**-7.410**	**-3.18**
N	1053			1053			560.000		
Pseudo R^2	0.11			0.12			0.230		
Log likelihood	-642			-1669			-180.000		

*Coefficients significant at the 10% level in bold

Table 8. Factors affecting voting decision

Dependent variable =Number voting for Ratsiraka	**2SLS (project variables omitted)**		**2SLS (includes project variables)**	
Population Characteristics	Coef.	t-stat	Coef.	t-stat
Gini coefficient (inequality)	**-993.345**	**-1.9**	**-915.890**	**-1.62**
Population density	-0.026	-0.41	0.004	0.04
Infant mortality rate	42.864	0.19	127.331	0.46
Literacy rate	**-2.608**	**-2.3**	**-2.785**	**-2.17**
Number of Voters (instrumented)	**0.346**	**13.19**	**0.363**	**18.93**
Political Base				
Mayor elected under Ratsiraka	18.258	0.72	16.786	0.54
Local Conditions				
Average rice price	-0.079	-0.78	-0.100	-0.87
Seasonal change in rice price	**-46.487**	**-2.75**	-27.372	-0.73
Clinic or hospital in commune	3.992	0.16	12.657	0.30
Electricity available in commune	-44.546	-0.67	-65.549	-0.83
Secondary school in commune	**57.556**	**1.67**	33.058	0.44
Information Access				
Radio reception	**65.857**	**2.04**	55.144	1
Television reception	44.448	1.17	32.917	0.57
Distance to major city	-19.208	-1.2	-17.559	-1.12
Region (Antananarivo omitted)				
Fianarantsoa	**274.105**	**2.71**	**322.266**	**2.79**
Toamasina	**668.807**	**6.94**	**750.507**	**5.34**
Mahajanga	**274.104**	**3.01**	**355.009**	**2.73**
Toliara	**295.472**	**2.94**	**359.253**	**3.06**
Antsiranana	**365.910**	**3.55**	**431.697**	**3.07**
Ethnic groups (estimated number)				
Merina	6.259	0.64	14.642	0.85
Betsimisaraka	**14.528**	**2.15**	**18.303**	**2.01**
Betsileo	2.106	0.29	4.065	0.43
Sakalava	-9.845	-1.60	-11.616	-1.03
Antandroy	-9.232	-1.44	-4.621	-0.60
Bara	-0.771	-0.14	-6.880	-0.42
Northern groups	**-23.888**	**-3.22**	**-31.065**	**-1.87**
Southeastern groups	-7.762	-1.46	-6.046	-0.72

Table 8. (continued)

Community Perceptions (1=bad/worse)				
Health relative to 5 years ago	-3.534	-0.13	-2.353	-0.06
Income relative to 5 years ago	-25.766	-0.94	-5.992	-0.15
Security and Crime	**-127.317**	**-4.71**	**-122.292**	**-3.54**
Constant	450.791	2.06	291.122	0.95
Public Goods				
New buildings (instrumented)			209.719	0.35
FID (instrumented)			-69.563	-0.92
N		1053		1053
R2		0.85		0.85

Table 9. Comparison of allocation of projects under different decision-making criteria

Percent of communes receiving projects in poverty min. allocation also receiving projects under different regimes.	Actual allocation	Patronage (public sector employees)	Vote Maximization Strategy	Actual # of districts receiving project	Total # of relavant districts
FID					
Poverty minimization (Fgt0)	46	65	46	487	1113
Poverty severity minimization (Fgt1)	42	40	41	---	---
Clinic					
Poverty minimization (Fgt0)	87	86	86	297	347
Poverty severity minimization (Fgt1)	84	84	88	---	---
School					
Poverty minimization (Fgt0)	33	42	30	83	494
Poverty severity minimization (Fgt1)	25	18	11	---	---

Table 10. Correlation coefficients between allocations

	Actual allocation	Patronage	Vote Maximization Strategy	Poverty minimization (Fgt0)
FID				
Patronage (public sector employees)	0.13			
Vote Maximization Strategy	0.22	0.11		
Poverty minimization (Fgt0)	0.04	0.37	0.04	
Poverty severity	-0.03	-0.06	-0.06	0.20
Clinic				
Patronage (public sector employees)	0.16			
Vote Maximization Strategy	0.00	0.00		
Poverty minimization (Fgt0)	0.09	0.04	0.04	
Poverty severity	-0.10	-0.12	0.18	0.35
School				
Patronage (public sector employees)	0.44			
Vote Maximization Strategy	0.13	0.10		
Poverty minimization (Fgt0)	0.13	0.04	-0.04	
Poverty severity	0.21	0.32	0.18	0.04

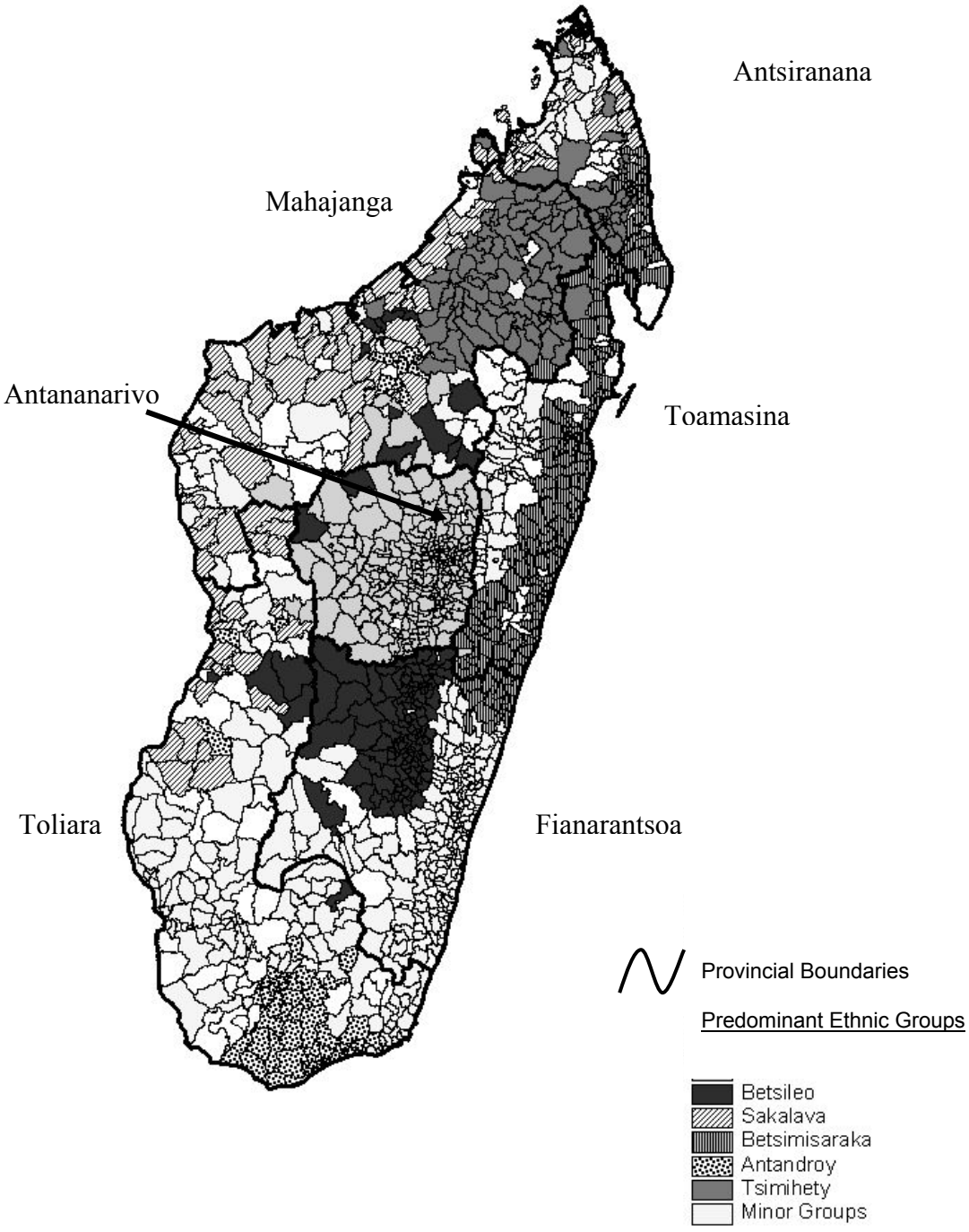

Figure 1. Provinces and major ethnic groups of Madagascar

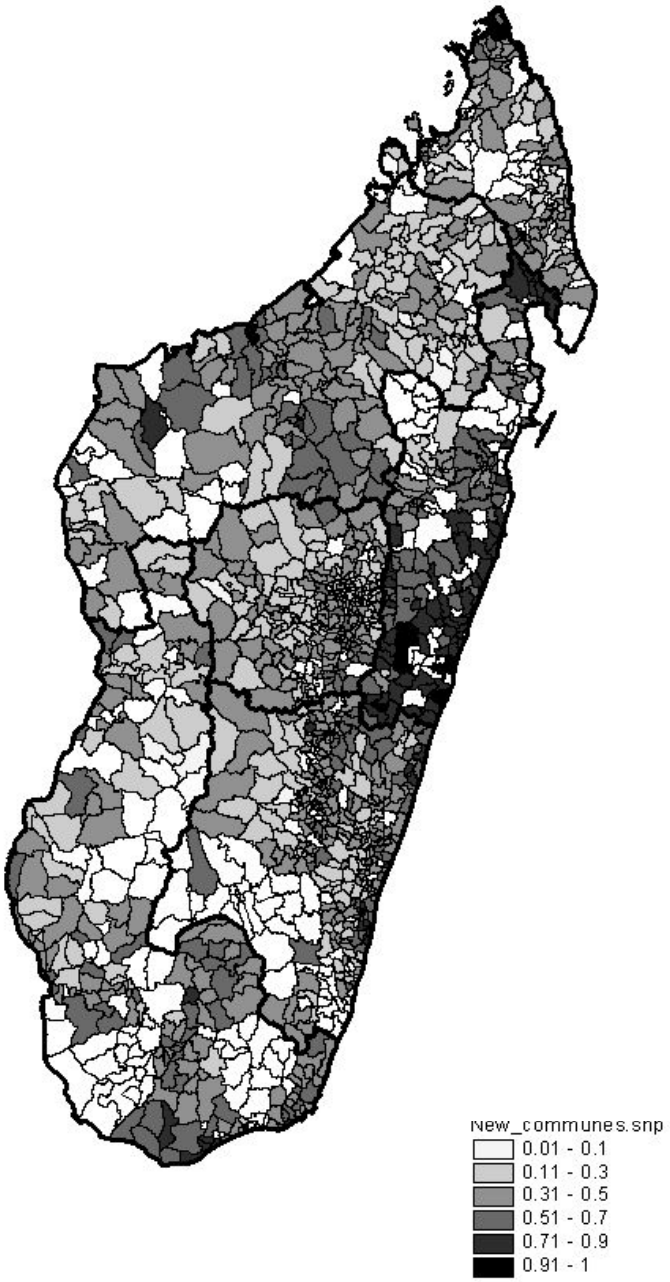

Figure 2. Proportion of voters voting for Ratsiraka (the incumbent) 2001

Appendix: Results from instrumenting equations

Table A1. Instrumenting equation predicting number of votes for Ratsiraka

Dependent variable= # voters voting for Ratsiraka		
Population Characteristics	Coef.	t-stat
Poverty rate (fgt0)	-0.011	-0.09
Population density	0.000	-1.02
Infant mortality	0.070	0.7
Literacy rate	-0.006	-0.78
Population	-0.001	-2.63
Existing Infrastructure		
Clinic in 96	-0.011	-1.22
Electricity in 96	-0.018	-1.24
School in 1996	-0.014	-1.37
Political Base and Information Access		
Mayor	0.014	1.56
Radio reception	0.014	1.38
Television reception	0.022	1.81
Travel time to major city	-0.013	-3.15
Province (Antananarivo is omitted category)		
Fianarantsoa	0.099	3.35
Toamasina	0.291	9.3
Mahajanga	0.135	4.62
Toliara	0.118	3.82
Antsiranana	0.130	3.91
Ethnic groups		
Merina	0.006	2.14
Betsimisaraka	0.009	3.85
Betsileo	-0.001	-0.27
Sakalava	-0.005	-2.12
Antandroy	0.001	0.53
Bara	0.005	1.48
Northern groups	-0.012	-4.16
Southeastern groups	0.001	0.35
Local Conditions (instruments)		
Average rice price	0.000	0.26
Seasonal change in rice price	-0.016	-2.13
Community Perceptions (1=bad/worse)		
Health relative to 5 years ago*	-0.005	-0.35
Income relative to 5 years ago*	-0.004	-0.45
Security and Crime*	-0.055	-5.08
Constant	0.431	5.07
N	1053	
R^2	0.140	

Table A2. Instrumenting equations for Table 8 estimation

	Number of Voters		FID		New Building	
Population Characteristics	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Gini	442.489	0.33	0.299	0.64	2.076	1.1
Population density	-0.139	-1.08	0.000	-1.45	0.000	-0.28
Infant mortality	-1021.742	-1.12	-0.300	-0.95	-0.345	-0.27
Literacy rate	4.331	1.23	0.000	0.03	-0.004	-0.73
Voting age population*	0.483	31.4	0.000	1.01	0.000	9.35
Existing Infrastructure						
Clinic in 96	-34.038	-0.37	-0.068	-2.1	-0.112	-0.86
Electricity in 96	478.823	2.96	0.047	0.84	0.000	0
School in 1996	-250.402	-2.55	0.123	3.61	0.028	0.21
Cyclone*	-26.470	-0.29	0.033	1.04	0.471	3.72
French *	-29.252	-0.32	0.010	0.31	-0.024	-0.19
New town*	136.753	0.99	-0.079	-1.66	-0.054	-0.28
Number of polling places in commune*	136.166	15.54	-0.002	-0.64	-0.020	-1.6
Political Base						
Mayor	155.805	1.7	-0.026	-0.83	-0.056	-0.43
Information Access						
Radio reception	-92.824	-0.95	0.069	2.03	0.004	0.03
Television reception	141.301	1.22	0.079	1.95	0.073	0.45
Travel time to major city	-119.427	-2.81	-0.003	-0.21	-0.039	-0.66

*instruments

Table A2. (continued)

Region (Antananarivo is omitted category)						
Fianarantsoa	-1277.944	-4.41	0.087	0.87	0.656	1.61
Toamasina	-434.177	-1.54	-0.025	-0.26	0.877	2.21
Mahajanga	-809.890	-2.84	0.173	1.74	1.547	3.86
Toliara	-1896.572	-6.17	0.080	0.75	0.611	1.42
Antsiranana	-502.565	-1.55	0.185	1.64	1.303	2.86
Ethnic groups						
Merina	-22.098	-0.79	-0.015	-1.6	0.069	1.76
Betsimisaraka	-91.861	-4.52	0.015	2.14	0.076	2.65
Betsileo	40.730	1.91	0.008	1.11	0.058	1.94
Sakalava	14.962	0.71	0.018	2.44	0.034	1.16
Antandroy	-30.741	-1.15	0.021	2.28	-0.037	-1
Bara	45.465	2.22	0.013	1.87	0.081	2.81
Northern groups	50.387	1.69	0.022	2.12	-0.003	-0.07
Southeastern groups	23.674	1.19	-0.004	-0.54	0.064	2.29
Local Conditions						
Average rice price	-0.234	-0.64	0.000	-0.83	-0.001	-1.18
Seasonal change in rice price	-97.781	-1.35	-0.051	-2.03	0.055	0.54
Community Perceptions (1=bad/worse)						
Health relative to 5 years ago	120.728	0.88	-0.055	-1.14	-0.136	-0.71
Income relative to 5 years ago	-45.140	-0.47	-0.024	-0.72	0.203	1.49
Security and Crime	-24.664	-0.24	-0.031	-0.89	-0.037	-0.26
Constant	261.833	0.42	0.310	1.45	-1.022	-1.18
N	1053		1053		1053	
R2	0.830		0.470		0.170	