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Who Gets The Schools?

Political Targeting of Economic and Social Infrastructure Provision in Zambia

Stefan Leiderer

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Bonn, August 2014

Stefan Leiderer

Abstract

This paper contributes to a growing body of literature on the political economy of public finance in developing countries. Its main methodological interest is to demonstrate the usability of household-level data to study political economy features of public finances in developing countries that commonly escape empirical scrutiny due to poor data availability. The immediate empirical interest is in testing whether there is evidence for or against either of two competing models of political targeting of public sector spending in Zambia: the swing-voter versus the core-voter model, the proposition being that in "typical" neo-patrimonial regimes in sub-Saharan Africa, the core-voter model should prevail. I use data from Zambia's Living Conditions Monitoring Survey (LCMS) to investigate whether there is evidence that the ruling party in Zambia followed political motives in targeting public infrastructure spending at the turn of the millennium. I find strong and robust evidence for the core-voter model applying to social infrastructure provision in Zambia. The findings suggest that it is primarily the construction of new health and education facilities that is affected by political targeting, whereas there is no strong evidence for such targeting for the improvement and rehabilitation of existing infrastructure. For the roads sector, the evidence is less conclusive: although the estimates show the same pattern as in health and education, they are not as robust to modifications in the econometric specification.

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Abbreviations

AfDB	African Development Bank
ATE	Average Treatment Effect
ATT	Average Treatment effect on the Treated (ATT)
CDF	Constituency Development Fund
CPD	Cox-Pesaran-Deaton test
CSO	Central Statistical Office of the Republic of Zambia
DIP	Decentralization Implementation Plan
ECZ	Electoral Commission of Zambia
EU–EOM	European Union Election Observation Mission
FDD	Forum for Democracy and Development
GMM	Generalised Method of Moments
LCMS	Living Conditions Monitoring Survey
LSMS	Living Standards Measurement Study
MMD	Movement for Multi-Party Democracy
MoFNP	Ministry of Finance and National Planning
MoLGH	Ministry of Local Government and Housing
MP	Member of Parliament
NDC	National Democratic Congress
NDP	National Development Plan
OECD–DAC	Organisation for Economic Co-operation and Development – Development Assistance Committee
OLS	Ordinary Least Squares
PF	Patriotic Front
PFM	Public Financial Management
SEA	Standard Enumeration Area
UDA	United Democratic Alliance
UNIP	United National Independence Party
UPND	United Party for National Development
ZCTU	Zambia Congress of Trade Unions

1 Introduction: political targeting of public expenditure in developing countries

1.1 Public financial management and the concept of neopatrimonialism

Over the past 20 years or so, there has been an enormous increase of interest in public finances in developing countries. To a good extent, this interest is driven by Western aid agencies' and researchers' concerns about the effectiveness of development aid and the fiduciary risks associated with channelling aid resources directly through recipient governments' own public financial management (PFM) systems.

This concern has resulted in a vast amount of reports and analytical studies on the performance of PFM systems and the political determinants of public spending in developing countries, above all in sub-Saharan Africa (de Renzio / Andrews / Mills 2010, 40). One of the central tenets of this body of – mostly "grey" – literature is that PFM systems in sub-Saharan Africa are hampered by characteristic features of the African state that lead to the inefficient use of public resources. The ensemble of these features is commonly subsumed under the concept of "neopatrimonialism", which is described as being characterised by the concentration of power in the hands of a small elite, particularly the head of state; few effective checks-and-balance mechanisms or horizontal and vertical division of power; the capture of public resources by these elites to maintain extended clientelistic networks and patronage systems; and the superseding (or hybridisation) of formal institutions and processes in the public administration by informal and personalised institutions, rules and relations (Bratton / van de Walle 1994; Erdmann / Simutanyi 2003; van de Walle 2001).

Although the general assessment of the negative impact of neopatrimonial regimes on the performance of PFM systems appears to be widely shared by researchers as well as aid practitioners, it proves remarkably difficult to test these claims empirically and assess the true extent to which neopatrimonialism affects the efficient use of public finances in developing countries. This paper demonstrates the usability of household survey data as a – so far under-exploited – source of information to study one key dimension of allocative efficiency in neopatrimonial regimes: the extent and nature of political targeting of public infrastructure investment across electoral constituencies.

1.2 Who's the target? Swing voters versus core voters

There exists a relatively large body of economic literature on the political economy of public spending in modern democracies. Much of this literature is concerned with empirically testing the central tenet of Downs' seminal *Economic Theory of Democracy* (Downs 1957) that "*political behaviour in a democracy can be understood as a rational effort to maximize the prospects of electoral success*" (Wright 1974, 30).

One important strand within this research, building on early work such as Nordhaus (1975), MaRae (1977), Hibbs (1977) and Tufte (1978), is concerned with the existence of political budget cycles, trying to explain how governments use expansionary fiscal and monetary policy in the run-up to elections in order to increase the chances of being re-elected (Blaydes 2008, 1; Shi / Svensson 2006, 1368).[1]

1 Until recently, empirical studies of political budget cycles focussed mostly on advanced industrial countries and found only inconclusive evidence of the existence of such cycles (Blaydes 2008; Shi / Svensson 2006).

A related but somewhat differently focussed strand of research is concerned not with the timing of government spending but with its distribution between social groups or across geographic and administrative entities. Two main competing theories exist of how politics may determine the allocation of public funds across beneficiaries: the swing-voter model of distributive politics (Lindbeck / Weibull 1987; Dixit / Londregan 1996), which argues that incumbents target public expenditure to win over undecided voters or buy back opposition voters with no strong political partisanship; and the core-voter model (Cox / McCubbins 1986), which posits that government spending is predominantly used to reward loyal constituencies and political strongholds.[2]

Which of these two competing models applies in real-world political processes is an empirical question that, to date, has not been conclusively answered. Similar to research on spending cycles, until recently most empirical work on politically motivated distribution of public spending focussed on OECD countries.[3] In what seems to be a majority of studies, authors find evidence that governments in rich countries use public spending to enhance their re-election probabilities by targeting swing voters and constituencies. This is true for well-studied federal spending under the "New Deal" in the United States, of which a disproportionate share targeted swing states (Couch / Shughart 1998), but also for expenditure programmes in countries such as Sweden, where, for instance, Dahlberg and Johansson (2002) find strong evidence for the swing-voter theorem in the distribution of intergovernmental "ecological" grants.

However, these findings are not undisputed, and a number of studies find evidence instead in support of the core-voter theorem of Cox and McCubbins. Levitt and Snyder (1995), for instance, find that federal outlays in districts in the United States in the second half of the 1980s were positively correlated with the number of democratic voters. Others, again, find evidence for governments to "mix" between the two models, e.g. Milligan and Smart (2005), who find the allocation of regional grants in Canada to be targeting both swing districts and districts represented by a member of the ruling party.

There are good reasons why indeed both theorems might be relevant in practice, depending on the particular context in which governments make their spending decisions. Evidently, the specifics of a country's electoral system and its concrete political constellation at a particular point in time can be expected to make a difference for how governments attempt to put public spending to use in order to ensure staying in power.[4]

Yet, various authors argue that it is not only the electoral system, but also a country's broader institutional set-up that ultimately determines whether a government favours swing or core vot-

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Newer research seems to confirm the existence of electoral budget cycles (e.g. Persson / Tabellini 2003), but also finds strong indications that the nature of such cycles may differ fundamentally between developed and developing countries (Shi / Svensson 2006).

2 Ansolabehere and Snyder (2006, 549) identify three rationales for core-voter targeting: (i) simple rent-seeking by parties, letting incumbent parties target areas with high concentration of supporters to benefit from government spending; (ii) mobilisation of supporters to vote; (iii) maximisation of credit a party or incumbent receives in case of shared programme responsibilities. Schady (2000, 290) offers two alternative or additional explanations: firstly, incumbents may be risk-averse, and thus more likely to invest in core supporters, whose needs and preferences they understand well, rather than in relatively "unknown" swing voters; secondly, Schady (2000, 290) argues that the fraction of transfers that actually materialise as a benefit to voters may be higher when these are targeted towards core supporters.

3 See, for instance, the extensive work on "New Deal" spending in the 1930s by Arrington (1969), Reading (1973), Wright (1974), Wallis (1984), Anderson and Tollison (1991), Wallis (1998) and others.

4 On the important role electoral systems play for fiscal policy choices, see, for example, Funk and Gathmann (2009).

ers. This suggests that, in countries with weaker administrative capacities, the core-voter model may prevail, whereas in countries with more efficient public sector institutions, the swing-voter model should apply.[5]

These considerations have led some authors to suggest that – similar to the phenomenon of political budget cycles – there might be systematic differences between the form in which political targeting of public expenditure occurs in rich countries, and how it is applied in developing countries, especially those with neopatrimonial and clientelistic structures.

By and large, most recent literature on the topic (especially that on politics in Africa) seems to follow this line of argument, suggesting that the particularities of developing countries' politics and institutions favour a core-voter model of public spending rather than a swing-voter model, which appears to be more relevant in advanced democracies.[6]

Yet, even from a neopatrimonial perspective, both models have theoretical merit: clearly, the need to maintain a wide network of loyal "clients" through patronage may be crucial for an incumbent's political survival in a neopatrimonial system, speaking indeed for the "core-voter" model to play an important role in the distribution of discretionary spending (van de Walle 2001; Kelsall 2012, 680). At the same time, however, staying in power certainly is a major motivation for an incumbent elite in a "winner-takes-all" political system (Bratton / van de Walle 1994, 465), eventually making it necessary to keep "swing voters" happy as well.[7]

It would seem that, ultimately, this question can only be decided empirically. Yet, to date, there is only limited evidence on the extent of political targeting of public spending in developing countries, and its impact on the efficient allocation of scarce resources (including those provided through government to government aid). The next section reviews some of the empirical literature that directly addresses the question of whether the swing-voter or the core-voter theorem applies in developing countries.

1.3 The difficult empirics of the political economy of public finance in developing countries

As discussed in the previous section, most work concerned with empirically investigating the political economy of public finances is focussed on industrialised Western democracies. It is only recently that more work in this strand has been undertaken on cases in developing countries, particularly in Latin America and – to a lesser degree – in sub-Saharan Africa.

The main empirical difficulty in studying questions such as whether the swing-voter or the core-voter theorem applies in practice in neopatrimonial or autocratic systems is the extremely limited availability of reliable data on government expenditure in poor countries.[8] As Reinikka

5 This point was, in principle, already made in the original argument by Dixit and Londregan (1996), who posited that the incumbents' decision depends on whether they can collect taxes and distribute benefits more effectively among their supporters than the general population. Where this is the case, incumbents should favour core voters, and swing voters otherwise (Schady 2000, 290).

6 Some authors such as Tavits (2009) argue that targeting core voters is a feasible and rational strategy, not only in developing countries but in advanced democracies as well.

7 In an alternative line of argument, Robinson and Torvik (2009), using Zimbabwe under Robert Mugabe as an example, argue that an incumbent government might have an incentive to repress and disenfranchise swing voters rather than "buy them" in order to maximise the probability of being re-elected.

8 Magaloni (2006), for instance, notes that it took three years to collect data on municipal-level spending in Mexico and that, still, the figures represent only an approximation of government expenditures.

and Svensson (2004, 679) emphasise, official budget data are typically the only source of information on public spending in low-income countries, and typically these poorly reflect the resources and services actually received by the intended beneficiaries. This is particularly true for sub-Saharan African countries, where fiscal data is usually difficult to obtain and notoriously unreliable. Thus, although there is a good amount of "narrative" work on the impact of neopatrimonial features of government systems on the quality of public financial management,[9] rigorous empirical analysis of the political economy of public spending in developing countries, in particular in sub-Saharan Africa, is fairly scarce. Existing studies mostly do not examine the total expenditure on public goods and services but rather intergovernmental transfers or specific subsidy programmes for which data are available. What is more, the evidence produced by these studies with regard to the swing-voter / core-voter controversy is somewhat inconclusive.

A number of studies, for instance, investigate the role of patronage politics in Mexico's PRONASOL poverty-relief programme, e.g. Molinar Horcasitas and Weldon (1994), Hiskey (1999) and Magaloni (2006). Whereas Hiskey (1999) finds evidence for the core-voter theorem in PRONASOL spending, Magaloni (2006), after controlling for simultaneity problems stemming from electoral outcomes being influenced by expenditures from earlier periods, finds evidence for the swing-voter model.

Schady (2000) examines the timing and geographic distribution of expenditures of the Peruvian social fund FONCODES between 1991 and 1995 and finds evidence for expenditure spikes ahead of elections that disproportionally benefited provinces loyal to President Alberto Fujimori, but also provinces that had supported Fujimori at the polls in 1990 but abandoned him in 1993, i.e. a rather specific form of the swing-voter model.

Faust (2012), in turn, analyses resource allocations in Bolivia's decentralised social fund Fondo de Inversión Productiva y Social and finds little evidence that the allocation scheme was captured by the government or any one of the traditional Bolivian parties. However, there appears to be evidence that municipalities governed by Evo Morales' anti-system party were significantly disadvantaged.

For India, Arulampalam et al. (2009) find evidence for an allocation strategy that mixes core-voter and swing-voter elements and under which aligned swing states receive higher transfers than states that are unaligned and non-swing.

In recent years, a number of studies have focussed on post-election targeting of agricultural subsidies, also with inconclusive findings: evidence reported by Mason, Jayne and van de Walle (2013) indicates that fertilizer subsidies in Malawi and Zambia were used to reward areas loyal to the ruling party.[10] In contrast, evidence from a similar study on a comparable programme in Ghana by Banful (2011b) suggests that the fertilizer vouchers were targeted to districts lost by the ruling party in previous presidential elections, and more so in districts lost by a larger margin.

Some related studies look at political economy factors in the distribution of aid projects, although these mostly do not directly address the question of whether the distribution follows a

9 See, for instance, Leiderer et al. (2007), O'Neil (2007), von Soest, Bechle and Korte (2011).

10 Mason, Jayne and van de Walle (2013) test both causal directions, i.e. whether election outcomes affect targeting of subsidised fertilizer, and whether fertilizer subsidies win votes in Zambia. They find no significant effect of subsidies on electoral outcomes.

core-voter or swing-voter model. Öhler and Nunnenkamp (2013), for instance, use geocoded data on the location of aid projects financed by the World Bank and the African Development Bank in a sample of 27 recipient countries to assess whether aid targets needy population segments. They find that political leaders manage to direct this aid (and especially physical infrastructure projects) to their home regions, irrespective of regional needs.

In a different approach to circumvent the problem of poor data availability on the geographic distribution of expenditures, Hodler and Raschky (2011) use satellite data on nighttime light intensity and information about the birth places of political leaders to study whether foreign aid is used to fund favouritism. They also find strong evidence that, in countries with weak institutions, local leaders are able to direct aid resources to their birth regions, but not so in countries with sound institutions.[11]

Briggs (2012) uses data from a large World Bank and bilateral-donor-funded National Electrification Project in Ghana that ran from 1993 to 1999 to examine whether the ruling party was able to allocate aid resources according to political criteria. Briggs (2012) finds that the ruling National Democratic Congress (NDC) was able to aim electrification at those regions and constituencies where it had received more votes in previous elections.[12]

In sum, the empirical evidence on the political targeting of public expenditure in developing countries is still thin and mostly inconclusive. More importantly, because of poor data availability, most of the existing evidence is either on ring-fenced aid projects, intergovernmental transfers or very specific government programmes such as agricultural subsidies. Although such programmes can represent a considerable share of the respective sector budgets, they usually account for only a small share of total government expenditure. For instance, the fertilizer subsidy programme investigated by Mason, Jayne and van de Walle (2013) and similar programmes in Zambia accounted for two-thirds of Ministry of Agriculture expenditure between 2003 and 2009. However, total agricultural expenditure (including donor-funded projects) accounted for only 7.4 per cent to 13 per cent of total government expenditure between 2000 and 2008 in Zambia (de Kemp / Faust / Leiderer 2011, 149f). The same applies to intergovernmental fiscal transfers, which usually represent only a minor share of public expenditure in neopatrimonial settings, where discretionary power over the use of resources tends to remain highly centralised.

Moreover, most existing studies investigate the distribution of transfers or subsidies that are relatively easy to target, as they typically involve either cash or in-kind transfers of private goods that are both excludable and rivalrous. It is, however, by no means clear whether findings on the political targeting of such subsidy programmes readily extend to general public expenditure and the provision of public goods and services.[13] Yet, it is the provision of public goods such as economic and social infrastructure that usually accounts for the lion's share of government expenditure in developing countries, and that presumably is essential for the economic and social development of these countries.

11 Although, strictly speaking, this is not necessarily evidence for the core-voter theorem, it provides support to the hypothesis that the strength of institutions plays a key role in determining the way in which public expenditure can be politically targeted by incumbent governments.

12 In return, Briggs (2012, 617) finds that electrification projects increased support for the NDC.

13 Diaz-Cayeros and Magaloni (2003, 4) argue that clientelism (i.e. the exchange of state resources for political support (Mason / Jayne / van de Walle 2013, 16)) and the provision of public goods are not contradictory but can coexist, being preferred by both voters and politicians.

Against this backdrop, this paper contributes to the literature discussed above by investigating whether the distribution of public infrastructure investment in a "typical" neopatrimonial state such as Zambia[14] follows politically motivated patterns, and whether these patterns are in line with either the swing-voter or the core-voter theorem. To circumvent the lack of reliable public expenditure data, this paper proposes the use of information from household survey data to approximate public infrastructure provision.

2 Empirical approach

2.1 Using household survey data to track political targeting in Zambia

Detailed data on public expenditure in sub-Saharan African countries is notoriously scarce and inaccurate. Publicly available sources such as the International Monetary Fund's Government Finance Statistics report mostly missing values for sub-Sahara African and other developing countries. At the country level, even in those cases where aggregate budget documentation is comparatively comprehensive and transparent, reliable data on the geographic distribution of public expenditure is usually very difficult to extract from budget documents and government financial reports, in particular for sectors that receive significant amounts of off-budget spending, e.g. from international donors. These constraints make sound empirical work on public finances in sub-Saharan Africa extremely difficult, if not often impossible.

At the same time, an increasing number of African countries have well-established databases on household-level living conditions based on regularly conducted Living Standards Measurement Studies (LSMSs). These surveys commonly include information on households' access to and use of public infrastructure and services.

Beyond contributing new evidence to the swing-voter / core-voter controversy, the main methodological interest of this paper is in demonstrating the usability of such survey data for these types of empirical questions. To do so, I employ data from Zambia's Living Conditions Monitoring Surveys (LCMSs) to test whether the geographic distribution of public infrastructure provision in Zambia around the turn of the millennium was politically motivated, and if so, which specific strategy the government employed in its political spending.

2.2 Empirical question and main variables

The main empirical question of this paper is whether the geographic distribution of public spending on physical infrastructure in Zambia is politically motivated, in the sense that public investment decisions are shaped by previous electoral outcomes; and – if there is evidence for such politically motivated spending – in which form it occurs.

Formally, the hypothesis underlying this question can be expressed as

$$I^j_{c\,t} = f(elec_{c,\,t-1}, z^j_{c,\,t}) \tag{1}$$

where the amount of investment I in economic and social infrastructure of type j in a constituency c in period t is a function of the electoral outcome ($elec$) in that constituency from the

14 See Appendix A for a discussion as to why Zambia lends itself particularly well as a case study to empirically track patronage in public spending in a "typical" neopatrimonial governance system.

preceding elections and a vector of other variables z that influence a government's decision on the amount and geographic distribution of infrastructure investment of type j.[15]

Unfortunately, in Zambia, as in most African countries, there is very little detailed – let alone reliable – data on public spending at a disaggregated level, i.e. there is no readily available direct measure of $I_{c\,t}^{j}$ to test this hypothesis underlying Equation 1.[16] However, as the following section explains, more readily available household survey data contains information that can be used as a proxy for public sector investment.[17]

2.2.1 Choice of dependent variable: proxying public sector investment

As described in Appendix B, the Zambia LCMS contains different types of household-level information that may be employed to approximate public expenditure at the constituency level. There are two obvious choices for constructing a proxy variable for physical infrastructure investment from this data, each with its specific advantages and disadvantages.[18]

For one, households are asked to report the distance to various types of facilities, including transport, health and basic education facilities. Investment in additional infrastructure in a constituency between two rounds of LCMS surveys should be reflected through a reduction in the average reported distance to the respective type of facility in that constituency, and the average change in distance should thus provide a rough proxy measure for (dis-)investment in public infrastructure at the constituency level.[19]

This measure would have the advantage that – by gauging the change in distance to a facility – it takes into account that, in some cases, the government may decide that it is more efficient to improve access to existing facilities by, for instance, building a bridge rather than an additional health or education facility. A disadvantage of this measure – besides the fact that it cannot be constructed for road infrastructure due to missing information in the LCMS – is that it only provides a proxy for the construction of new facilities and disregards investment in improving or rehabilitating existing infrastructure.

The main downside of using changes in average reported distances as proxy measures for investment in public infrastructure, however, is that it relies on aggregate information from dif-

15 This formulation takes into account that the provision of each type of infrastructure such as roads or health and education facilities may each depend on different factors.

16 This not only applies to government spending from the national budget; as in all aid-dependent countries, significant amounts of public spending in Zambia are channelled outside government systems, e.g. by international donor agencies or non-governmental organisations that carry out projects and programmes at various levels and in different sectors in the country. Although the latter does not imply that the central government cannot influence the allocation of these resources, there usually is no unified and publicly available reporting system on this type of expenditure (see, for instance, de Kemp / Faust / Leiderer 2011, 142). What is more, both governments and donors are usually reluctant to publish this kind of information.

17 Appendix B describes the data sources and construction of the main variables.

18 The focus on infrastructure investment rather than general public expenditure is a pragmatic choice. The LCMS does contain information that could arguably be used to construct proxy variables for the provision of general services in some sectors as well, but only with important conceptual difficulties and burdened with empirical challenges such as the need to control for quality. In comparison, the information used to approximate infrastructure investments is much less ambiguous.

19 Because the LCMS does not survey the same households in each round, it is not possible to observe reductions in distance for individual households.

ferent households in each period, since the LCMS is not a balanced panel but surveys a new sample of households in each round. This may lead to important reporting and measurement errors.

A brief inspection of the averages across all constituencies of this change-in-distance measure for the three periods 1996–1998, 1998–2006 and 2006–2010 (shown in Table 1) suggests that this may indeed be the case: whereas the mean reduction in distance for the two later periods for all three types of facilities is positive, indicating improved access to infrastructure as measured at the national level, there are suspiciously large positive and negative changes between the two points in time. For the 1996–1998 period, the average reduction in distance is negative for health and 0 for education infrastructure, suggesting an overall deterioration of health and stagnation in education infrastructure across the country.[20]

Table 1: Change in access to facilities 1996–1998, 1998–2006 and 2006–2010*

	1996-1998				1998-2006				2006-2010			
	min	max	mean	sd	min	max	mean	sd	min	max	mean	sd
Transport	-	-	-		-21.96	75.24	2.08	11.10	-50.97	19.19	.50	7.07
Health	-38.36	.72	-6.48	6.70	-17.87	33.64	1.32	6.66	-28.25	15.89	.39	4.76
Education	-13.14	7.94	-.01	2.08	-12.35	15.47	.26	2.61	-4.48	11.31	1.80	1.80

*Average distance reduction in km per constituency

Source: Author, based on LCMS 1996, 1998, 2006, 2010

Fortunately, an alternative and more direct measure of infrastructure investment is available from the LCMS. In each round, households are asked whether different types of projects have taken place in their community in the period preceding the survey, including construction and improvement / rehabilitation of health and education facilities as well as building and improving different types of roads.[21] A straightforward way to construct measures for infrastructure investment at the constituency level from this information is to calculate the share of households in each constituency reporting a particular type of infrastructure project.[22]

The advantage of basing a (proxy) measure of infrastructure investment on this kind of household reporting is that it records both construction and rehabilitation / improvement of roads and facilities. Thereby, it is possible to account for the fact that in some (e.g. urban) areas where more infrastructure already exists, the rehabilitation and improvement of existing roads,

20 Note that the values given in Table 1 are reduction in distance, i.e. a positive value represents improved access to infrastructure, a negative value stands for a deterioration in access. Especially the large negative minimum values (representing an increase in distance to the nearest facility) cast doubt on the accuracy of this measure and the aggregation across different households in different survey rounds. Evidently, facilities may be abandoned or destroyed and – as anecdotal evidence suggests – it is not uncommon for rural communities' access to existing infrastructure to be disrupted by rains washing away roads and bridges (Leiderer et al. 2012). However, these occasional events would hardly seem sufficient to explain the large negative measures observed in the data.

21 In the 1998 LCMS, households were asked to report whether projects had taken place during the past five years. In the 2006 and 2010 LCMSs, the reporting period was reduced to the 12 prior months. For details, see Appendix B.1.

22 This approach is similar to the one taken by Terberger et al. (2010), who use the share of households in each of 187 traditional "chief areas" reporting road projects as a measure of the extent to which households in an area benefited from road infrastructure investment in order to assess the impact of roads on poverty and other measures of well-being.

schools and health posts and clinics may be more relevant than in other areas where construction of new facilities is more relevant.

At the same time, this measure is not a perfect gauge of infrastructure provision at the constituency level either. For one, taking the constituency share of households reporting an infrastructure project obviously involves a large amount of "double-counting" of individual projects, as households located in one area will report on the same roads or facilities constructed or improved in their neighbourhood. This implies that, for any given level of infrastructure investment, one would expect the share of households being aware of that investment to be larger in smaller and more densely populated constituencies than in larger, less populated ones. Consequently, there is a need to control for population density when using this measure as a proxy for investments undertaken.[23]

Moreover, because the question in the 2006 and 2010 LCMSs records only projects undertaken in the 12 months prior to the survey, it most likely captures only a fraction of the infrastructure projects undertaken since the preceding survey (and the last elections). This would certainly be an important limitation if the objective was to gauge the total amount of public infrastructure investment between surveys. For the empirical question at hand here, however, it should not pose a problem as long as the government discriminates between supporting and opposition constituencies only, with respect to the amount – and not the timing of – infrastructure provision.[24]

2.2.2 Main explanatory variables: identifying swing and core voters

The main explanatory variable in the model described by Equation 1 is the outcome of elections preceding the respective household survey. It is, however, by no means obvious as to what the appropriate measure for this outcome should be; in particular, whether this measure should be based on the ruling party's electoral success in parliamentary or presidential elections.

The literature on neopatrimonialism in Africa does not give clear indications in this respect. In principle, one of the key features of neopatrimonial regimes is the concentration of power and resources in the presidency, whereas parliaments in these systems tend to be weak and mostly accountable "upwards" to their party leaders rather than "downwards" to their constituencies (Cammack 2007, 603).[25] This would *prima facie* speak for the outcomes of presidential elections being the relevant main explanatory variable. At the same time, however, political leaders' reliance on clientelistic networks might mean that an incumbent president in a neopatrimonial system has to use available resources to keep key party members (i.e. members of parliament) content by strengthening their power base and thus increase their chances of being re-elected. In this case, parliamentary elections might matter more than presidential ones for determining the government's allocation decisions, even though control over public resources is concentrated in the president's hands.

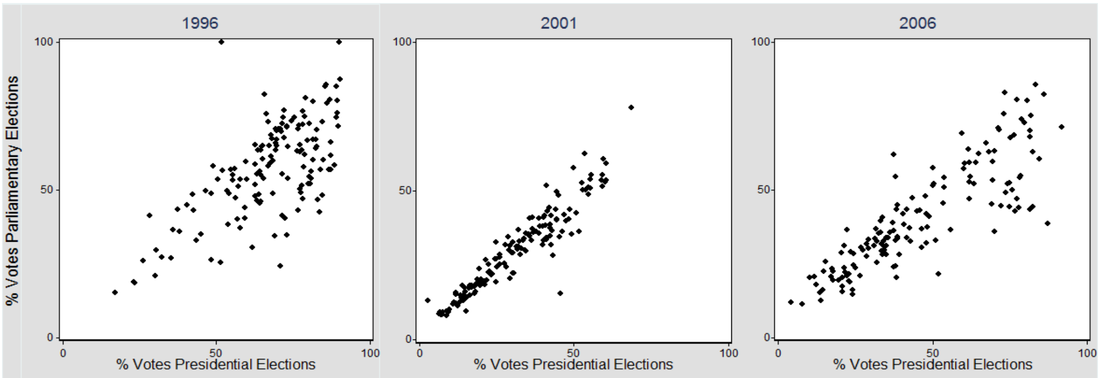
23 There are other reasons too for controlling for population density related to efficiency considerations in the distribution of infrastructure (see Section C).

24 Although it is one of the tenets of some of the literature reviewed in Section 1.3 that politicians tend to time public expenditure in order to increase the probability of being re-elected, there is no particular reason (and no indications from the literature) to suspect that the timing of projects should systematically differ between constituencies that show different degrees of support for the ruling party or candidate.

25 This observation certainly applies to Zambia (see, for instance, de Kemp / Faust / Leiderer 2011, 104).

From a theoretical point of view, it is thus by no means clear whether the outcomes of presidential or parliamentary elections should be expected to drive allocation decisions in case political targeting takes place. Obviously, both are highly correlated; yet, as shown by plotting the percentage shares received by Zambia's ruling Movement for Multi-Party Democracy (MMD) in the 1996, 2001 and 2006 presidential elections against those received in parliamentary polls (see Figure 1), this correlation is far from perfect and varies substantially between periods,[26] earning this question some closer scrutiny. For the initial steps of the analysis, I therefore examine the role of electoral success of the ruling party in both parliamentary and presidential elections.

Figure 1: Constituency vote shares for MMD in presidential and parliamentary elections



Source: Author, based on data provided by ECZ

Besides this question, there are also different possibilities for how electoral "success" should be defined, in terms of absolute majorities (i.e. the share of votes received in a constituency), or relative majorities (i.e. the margin by which a constituency is won or lost). The "correct" measure for electoral success will depend on the way in which the government arrives at its decision that a constituency forms part of its own power base and therefore merits disproportional infrastructure investment under the core-voter model, or that a constituency is "contested enough" to attract investment under the swing-voter stratagem. Linking to the discussion above, the government's assessment in this respect might differ, depending on whether it considers parliamentary or presidential electoral outcomes, given the different voting systems in each: presidential elections in Zambia (as in all presidential systems) are decided by the nationwide majority of votes, whereas parliamentary seats are contested at the constituency level in a first-past-the-post system. Given this fundamental difference of how winners are determined, one would, in principle, expect the government to consider absolute vote shares in presidential elections, and relative majorities in parliamentary elections.

Crucially, however, whether the government considers vote shares or winning (and losing) margins in its allocation decision might depend not only on whether it bases this decision on presidential or parliamentary elections, but also on whether it follows the swing-voter or core-voter stratagem. This is because the government cannot observe individual voters' preferences to target its infrastructure investment in such a way as to either win over the maximum

26 Pairwise correlation coefficients are: .68 (1996), .94 (2001) and .85 (2006).

number of swing voters or "reward" the maximum number of its supporters.[27] Instead, it has to derive voters' expected political preferences from constituency electoral outcomes (Schady 2000, 290).

As can be shown, the probability that a randomly selected voter in a constituency will have voted for a particular party is equivalent to the share of the vote for that party in the constituency (Schady 2000, 290; Deacon / Shapiro 1975). In other words, swing voters live in swing constituencies, i.e. voters in highly contested constituencies are more likely to be swing voters than individuals in less contested constituencies. Vice versa, core voters with a strong preference for one party tend to live in constituencies with a high vote share for that party. This implies that if the government wants to benefit mainly its core supporters, then it should target those constituencies where it received the highest vote shares, as these will have the largest share of loyal supporters in the population. Conversely, if it wants to target the maximum number of voters who can be easily swayed to support one party or another, then it should target constituencies with narrow relative majorities, as these can be expected to have the largest share of such swing voters in the population. This, however, will not depend on the absolute share of votes received by the ruling party alone, but also on the distribution of votes among opposition candidates. Thus, if the government wants to win over swing voters, then the margin by which a constituency was won or lost should be the decisive factor. Conversely, if the government wants to use public infrastructure investment to reward its core voters, then it should base its allocation decision on the absolute share of votes received in a constituency.

As the purpose of this empirical analysis is to test these two proposed targeting models against each other, to start with, I take both measures for electoral success into consideration.

2.2.3 Control variables

Evidently, there is a range of confounding factors that may influence the central government's decisions about where to provide road, health or basic education infrastructure and therefore need to be controlled for. For the main regressions, to control for general deprivation, I include the constituency's poverty headcount; to control for size effects, a possible rural-urban bias and double counting of projects, the square root of the constituency population, the district population density and dummy variables identifying whether a constituency is located in a municipal or city district (rural districts providing the reference category) are included. To control for sector-specific deprivation, I include the average reported distance to the nearest transport, health and basic education facilities. For geographic factors such as climate, topography and remoteness, I include province dummies; and as a measure of ethnic group dominance, I include dummies for four of the five largest language groups, indicating whether at least 30 per cent of household heads in a constituency indicate using that language as their primary language.

Additional controls for robustness checks include the distances by road to the national capital and the respective province capital, the percentage share of households belonging to each of the main language groups, and households' expressed preferences for infrastructure projects to be implemented in their community.

A more detailed description of the rationale for each of these controls is given in Appendix C.

27 In addition, of course, individuals or households located in the same area cannot be excluded from the use of public infrastructure such as roads, health centres or schools constructed in that area.

3 Econometric specification and empirical findings

The remainder of this paper is concerned with, first, empirically testing whether the general relation suggested by Equation (1) in Section 2.2 applies in Zambia, i.e. whether the geographic distribution of public infrastructure provision is subject to political targeting; and second, exploring the functional form of f, that is, whether such targeting is in agreement with the predictions of either the swing-voter or the core-voter theorem.

As discussed in the previous section, in the absence of detailed and reliable data on government expenditure, I use information from the Zambia Living Conditions Monitoring Survey (LCMS) on households' reporting of infrastructure projects in their community as a proxy for the public (or publicly sanctioned) provision of economic and social infrastructure. As an initial approach, I take the percentage share of households within each constituency that report at least one infrastructure project (construction or improvement / rehabilitation) in any of the three sectors – roads, health or basic education – in the 1998, 2006 and 2010 LCMSs, respectively, and regress this share on electoral outcomes of the previous parliamentary and presidential elections (held in 1996, 2001 and 2006).[28]

3.1 Electoral success and infrastructure provision

Exploring the evidence for political targeting of infrastructure provision in the data without pre-empting the functional form in which this targeting occurs, requires an econometric specification that can accommodate for both proposed targeting models. Banful (2011b)[29] formulates such a model (based on relative majorities) by including three main independent variables in the regression: a dummy variable *"won"* indicating if a constituency was won by the ruling Movement for Multi-Party Democracy (MMD) in elections preceding the relevant LCMS reporting period; a variable *"margin"* that gives the (absolute) difference in the percentage of votes received by the ruling party's candidate and by the strongest opposition candidate in that constituency; and an interaction term of these two variables.[30] The logic of this specification

28 Note that this is a conservative measure of the number of infrastructure projects undertaken in a community, as every household is counted only once, irrespective of how many different projects it reports. Although this clearly tends to underestimate the amount of infrastructure provided, this choice is made for ease of interpretation of the results. The difficulty lies in aggregating the information provided by households on different projects in different sectors. An alternative way to do this would be to simply sum up the percentage shares of households in a constituency reporting improvement and construction projects in each sector, yielding values for the aggregate dependent variable between 0 and 600 (improvement / rehabilitation and construction projects in three sectors), or 300 if construction and improvements are viewed separately. All regressions for aggregate outcome variables reported in this section (including those for construction or improvement / rehabilitation only) were also run with aggregates calculated in this way. The results do not differ substantially and support the findings reported throughout this section (yielding higher coefficients and significant results in some cases), yet coefficients are very difficult to interpret using these specifications.

29 Banful (2011b) studies political targeting of fertilizer subsidies in Ghana. The same specification is used by Mason, Jayne and van de Walle (2013) in their study of fertilizer subsidies in Zambia. Both studies use presidential election outcomes as the main explanatory variables.

30 The MMD was in power continuously from 1991 to 2011 (see Appendix A). However, the vote share that secured a majority for the MMD's candidate at the constituency level varied substantially between constituencies and years during that period, as did the vote margins in those constituencies won and lost. For presidential elections in 1996, the average share of votes winning the MMD a majority in a constituency (with only 10 constituencies lost) was 70.02 per cent of the cast votes (standard deviation 12.8). The smallest share of cast votes securing a "win" in a constituency was 35.21 per cent, whereas the highest vote share losing the MMD a constituency was 38.11 per cent. The average margin between the MMD's candidate and the strongest

is as follows: if electoral outcomes do not affect the government's allocation decisions, then the coefficients on all three electoral variables ("won", "margin" and their interaction) are expected be 0. In case infrastructure investment is politically targeted (based on vote margins), then the coefficients on the "margin" variable and its interaction with the "won" dummy should be different from 0. In case the swing-voter model applies, both should be negative, as more contested constituencies receive higher levels of investment than less contested ones. Under the core-voter model, in turn, one would expect a negative coefficient on the "margin" variable and a positive sign on the interaction term, as constituencies receive higher levels of investment when their support for the ruling party is stronger.

Using this specification, I estimate the three available cross-sections (1996, 2001, 2006 elections; 1998, 2006, 2010 LCMSs) jointly in a three-period panel as well as individually for both parliamentary and presidential elections, using any type of infrastructure project (i.e. construction or improvement of roads, health or education facilities) as the dependent variable. To account for the fact that the overall investment volume varies over time, I allow for time-fixed effects.

When choosing the appropriate panel estimator for the described model, one faces a dilemma, however. In order to account for the fact that the dependent variable is censored left at 0 and right at 100 per cent, one would preferably estimate a fractional response or a two-limit tobit model, since a linear estimator might be biased under these circumstances. At the same time, it cannot be ruled out that there might be unobserved constituency characteristics that are correlated with election outcomes. If this were the case, then a random effects estimator would produce biased results, and a fixed effects estimator would seem more appropriate (assuming that the unobserved variables are time-invariant). Unfortunately, there is no parametric fixed effects estimator for models allowing for censoring of the dependent variable. Moreover, many of the included control variables are time-invariant, meaning that their influence on infrastructure provision cannot be identified in a fixed effects model.[31]

There is thus no ideal solution for estimating the repeated cross-sections as a panel. On balance, for this initial analysis, preference is given to the fixed effects model, seeing that the censoring of the dependent variable is of minor importance for the aggregate infrastructure measure,

contender was 53.10 percentage points (51.76 in constituencies won, 1.35 in those lost). In the 2001 (2006) elections, the average share of votes in constituencies carried by the MMD candidate was 44.26 (63.68) per cent with a standard deviation of 9.76 (13.21). The average vote for the MMD candidate in constituencies "lost" by the MMD was 20.49 (24.00) per cent, with a standard deviation of 9.37 (10.26). The average vote margin in 2001 was 26.69 percentage points (10.67 in those won, 16.02 in those lost by the MMD); in 2006 it was 38.62 percentage points (21.04 in those won, 17.58 in those lost). For parliamentary elections, the equivalent average margin was much more consistent over time, with 36.88 percentage points in 1996 (34.15 in those won, 2.73 in those lost), 23.50 percentage points in 2001 (11.39 in those won, 12.10 in those lost) and 26.71 percentage points in 2006 (14.78 in those won, 12.23 in those lost).

31 Unfortunately, a standard Hausman test to check whether the random effects model is appropriate cannot be applied here, as the test's requirement that the data cannot be clustered is presumably violated here. A feasible test of the random effects versus the fixed effects model (in a linear model) in this case is the artificial regression approach described by Arellano (1993) and Wooldridge (2002, 290f.), in which a random effects equation is re-estimated, augmented with additional variables consisting of the original regressors transformed into deviations-from-mean form (implemented by the STATA "xtoverid" command). Unlike the Hausman test, the xtoverid procedure extends straightforward to heteroskedastic- and cluster-robust versions. The null-hypothesis of this test – that the difference in coefficients between the fixed effects and random effects model is not systematic – is not rejected at the conventional levels for either health or education infrastructure, indicating that the random effects model is appropriate for the linear model with clustered standard errors (xtreg) and, by extension, should produce unbiased (and efficient) estimates in the tobit specification.

and the potential bias in the estimates introduced by ignoring the censoring of the dependent variable (and estimating a linear model) can thus be expected to be less important than the bias caused by the potentially inconsistent random effects estimator.[32] At the same time, it is not unlikely that in the relatively small panel data set available for this analysis – with a maximum of 150 observations and only 3 periods – there is insufficient variation in the main variables over time for the fixed effects estimator to produce significant coefficients. Because of this, and in the interest of comparability of panel regression results with those for individual cross-sections, tobit random effects and GLS random effects estimates are also reported throughout the initial steps of this analysis.

The econometric model for the fixed effects panel regression then takes the form

$$\begin{aligned} share\_proj_{c,t} &= \alpha_t + \mu_c + \beta_1\ won_{c,t} + \beta_2\ margin_{c,t} \\ &\quad + \beta_3\ won \times margin_{c,t} + \delta\ z_{c,t} + \varepsilon_{c,d,t} \end{aligned} \tag{2}$$

where $share\_proj_{c,t}$ is the share of households in constituency c reporting investment in infrastructure in period t; α_t is the sum of a constant and a time-fixed effect; μ_c is a constituency-specific effect; $won_{c,t}$ is a dummy variable with value 1 if constituency c was carried by the MMD candidate in elections in t, and 0 otherwise; $margin_{c,t}$ is the absolute difference of the vote share received by the MMD's candidate and that of the strongest opposition candidate in constituency c in t; z_{ct} is a vector of control variables; and $\varepsilon_{c,d,t}$ is a (district-clustered) error term.[33] As explained in Section 2.2.3, z_{ct} includes the access (measured by average reported distance) to transport, health and education infrastructure in the previous reporting period as a measure of a constituency's deprivation in each sector, as well as the constituency's poverty headcount as a measure of general deprivation. Province dummies are included to account for geographic factors. In addition, in order to control for ethnic group dominance, I include 30 per cent language group share dummy variables.[34]

32 In fact, for the combined dependent variable that gives the share of households per constituency reporting any kind of infrastructure project, censoring is not a real issue, with only four left-censored cases in 1998, one in 2006 and two in 2010; and three right-censored observations in 1998, none in 2006 and two in 2010. For the more disaggregated infrastructure indicators used in the regressions further down, however, left-censoring is potentially much more relevant: for instance, in 1998, households in 85 constituencies reported no construction of roads, in 47 no construction of health facilities and in 42 no construction of basic schools. In 2006 (2010) the respective numbers are roads: 47 (37), health: 24 (30) and education 17 (17). For rehabilitation and improvement of existing facilities, the number of censored observations in 1998, 2006 and 2010 for roads is: 32, 18, 21; for health: 31, 15, 14; and for education: 12, 3, 6. Right-hand censoring, however, is evidently not of major importance in the data: in 1998 and 2010 there were only three constituencies in which all households report "any improvement"; in 2010 there is one with all households reporting "any construction". For the individual sector indicators, there is only one constituency in 2010 in which all households report improvement / rehabilitation of a basic education facility. Taking this into account, all regressions for disaggregated indicators as well as individual cross-sections further down are tobit regressions accounting for left-censoring at 0.

33 Taking into account the fact that groups of constituencies lie within the same districts and that – even though the financial resources at this lowest administrative tier are extremely limited – at least some planning and possibly decision-making takes place at the district level, the estimates may be affected by intra-group correlation of errors. I therefore cluster standard errors at the district level in 72 district clusters.

34 Note that for the dependent variable, i.e. share of households reporting infrastructure investment, t stands either for the LCMS of 1998, 2006 or 2010. For the main explanatory variable, i.e. presidential or parliamentary election outcomes, t stands for the 1996, 2001 and 2006 elections, respectively. Some of the control variables are (taken to be) time-invariant, such as province dummies and ethnic group dominance. For those control variables that measure infrastructure needs or general deprivation, such as distances to transport, health and primary education facilities, or the constituency's poverty headcount, values are calculated from

Table 2 shows the random and fixed effects panel regression results for parliamentary and presidential elections and any type of infrastructure project (i.e. construction or rehabilitation of roads, health or basic education facilities).[35] Most notably, the positive and highly significant coefficient on poverty across all panel specifications suggests that overall public infrastructure provision in Zambia over the observed period was predominantly targeted at poorer constituencies, although in the cross-sections this is only significant for the 2006 reporting period. Besides poverty levels, size (in population), geographic location and/or ethnic group dominance appear to explain most of the variations between constituencies with respect to reported infrastructure investment.

In addition, however, the results in Table 2 suggest that infrastructure investment in Zambia indeed seems to have been subject to political targeting during the observed period, and that this targeting followed the core-voter stratagem rather than the swing-voter model. For parliamentary elections in both random effects models, the partial effect of the vote margin in constituencies lost by the MMD's candidate is negative and significant, whereas the vote margin in those constituencies carried by an MMD candidate is positive and significant. The negative coefficient on the *won* dummy variable is further evidence for the core-voter and against the swing-voter model. It indicates that just winning a constituency (when the vote margin is 0) has a reductive effect on the share of households reporting infrastructure investment. It is only with a sufficiently large vote margin that a won constituency receives more than average infrastructure investment.[36] Under the swing-voter model, one would expect the opposite, i.e. a positive coefficient on the *won* dummy and a reductive effect of the vote margin.[37]

In the fixed effects specification, the signs remain the same, and the partial effect of the vote margin in constituencies won is positive and significant, but only statistically different at the 10 per cent level from that on the vote margin in constituencies lost, which remains negative but becomes statistically insignificant at conventional levels (see Figure 2, which shows the fixed effects estimates of the partial effects of vote margins for parliamentary and presidential elections in the three periods with 90 per cent confidence intervals).[38]

For presidential elections, although the signs on vote margins in constituencies lost and won are also in line with the core-voter model, the coefficients are insignificant at conventional levels in all three specifications.

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the respective preceding LCMS, i.e. from the 1996, 1998 or the 2006 LCMS for the 1998, 2006 and 2010 reporting periods; the reason being that this arguably reflects best the government's own information on which to base its allocation decisions during the period covered by the respective reporting round.

35 Note that with available STATA packages, clustered standard errors for random effects panel tobit regressions require bootstrapping, and the reported standard errors of the panel estimations are thus (panel-robust) bootstrap standard errors (see Cameron / Trivedi 2005, 708). Bootstrapping inflates the standard errors for some controls, indicating (expected) multicollinearity of some of these variables.

36 To illustrate this point: in the 2006 parliamentary elections, there were 18 constituencies with a vote margin smaller than 5 percentage points. In these constituencies, the average vote share received by the MMD candidate was 35.7 per cent, i.e. in a constituency just won by the ruling party, one would, on average, expect about two-thirds of the voters to support an opposition candidate.

37 See Brambor, Clark and Golder (2006) for a comprehensive discussion of the interpretation of multiplicative interaction models.

38 This result is in line with the study of Mason, Jayne and van de Walle (2013) on political targeting of fertilizer vouchers in Zambia. They find a (mostly insignificant) coefficient on the vote margin and a strongly significant positive sign on the interaction term, but results differ from Banful (2011b), who in a similar study for Ghana finds a positive sign on the vote margin and a negative sign on the interaction term, i.e. evidence for the government targeting opposition strongholds.

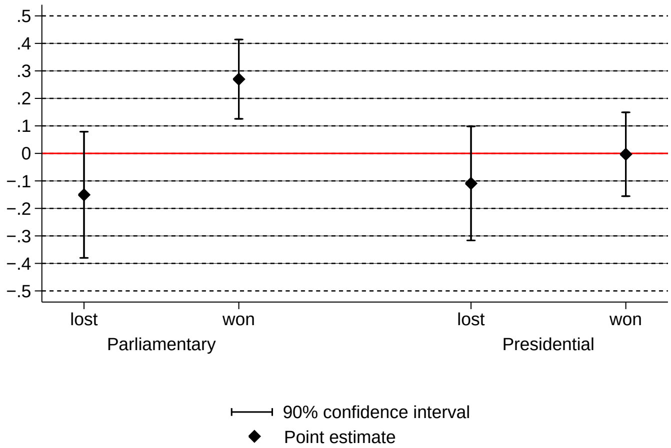
Table 2: Vote margins and infrastructure provision: panel regression results

	Parliamentary			Presidential		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
won MMD	–11.387***	–11.222***	–11.520**	–3.292	–3.341	–4.526
	(4.33)	(4.18)	(4.62)	(4.60)	(4.29)	(5.36)
margin	–.242**	–.246**	–.151	–.105	–.111	–.109
	(.12)	(.11)	(.14)	(.09)	(.08)	(.12)
won x margin	.452***	.452***	.420***	.117	.124	.106
	(.14)	(.14)	(.16)	(.12)	(.11)	(.15)
2006	–15.143*	–15.005*	–16.793**	–20.269**	–19.944**	–25.650***
	(7.87)	(7.78)	(7.49)	(8.31)	(8.46)	(8.04)
2010	–14.358**	–14.156**	–13.669**	–18.311**	–17.971**	–20.478***
	(6.69)	(6.47)	(6.53)	(7.33)	(7.36)	(7.07)
access trans	–.284*	–.273**	–.038	–.264	–.255*	.023
	(.16)	(.14)	(.17)	(.17)	(.14)	(.19)
access health	.493	.484	.978***	.507	.501	.877**
	(.31)	(.30)	(.36)	(.33)	(.32)	(.39)
access edu	–.680	–.667	–.161	–.593	–.586	.153
	(.70)	(.67)	(.86)	(.74)	(.70)	(.90)
Municipal	–2.380	–2.361		–2.756	–2.788	
	(3.14)	(2.52)		(3.08)	(2.41)	
City	–2.339	–2.364		–4.530	–4.547	
	(11.53)	(5.35)		(11.59)	(5.07)	
poverty	.312***	.311***	.328***	.347***	.344***	.403***
	(.09)	(.08)	(.09)	(.09)	(.08)	(.09)
pop density	–.001	–.001	–.004*	–.000	–.000	–.002
	(.03)	(.00)	(.00)	(.03)	(.00)	(.00)
sqrt pop	–.039***	–.039***	–.065**	–.036**	–.036***	–.066**
	(.01)	(.01)	(.03)	(.01)	(.01)	(.03)
Provinces						
Central	19.595***	19.224***		22.026***	21.308***	
	(6.88)	(5.53)		(6.92)	(5.61)	
Copperbelt	21.457***	21.126***		26.725***	26.017***	
	(8.04)	(6.85)		(8.00)	(6.74)	
Eastern	30.816***	30.391***		32.172***	31.474***	
	(9.91)	(5.89)		(9.34)	(5.79)	
Luapula	34.702***	34.319***		36.136***	35.596***	
	(6.78)	(6.04)		(6.64)	(5.83)	
Lusaka	32.002***	31.583***		34.242***	33.482***	
	(11.44)	(7.95)		(11.27)	(7.78)	
Northern	28.484***	28.082***		30.576***	29.866***	
	(5.25)	(4.29)		(5.60)	(4.73)	
North-Western	–1.288	–1.412		–.479	–.656	
	(5.11)	(4.21)		(5.06)	(4.12)	
Southern	27.146***	26.940***		27.968***	27.522***	
	(7.97)	(5.32)		(8.41)	(5.57)	
Language Groups (≥ 30 %)						
Bemba	–8.181	–8.226*		–9.002*	–9.015**	
	(5.18)	(4.20)		(4.98)	(4.14)	
Tonga	–7.217	–7.185		–7.941	–7.862	
	(7.37)	(4.99)		(7.57)	(5.03)	
North-Western	19.824***	19.747***		20.338***	20.027***	
	(5.07)	(3.94)		(5.68)	(4.27)	
Nyanja	–1.680	–1.677		–2.417	–2.373	
	(9.63)	(6.40)		(8.85)	(5.80)	
Constant	42.089***	42.520***	60.196***	38.630***	39.416***	61.987***
	(4.55)	(3.93)	(4.51)	(5.82)	(4.85)	(5.85)
N	441	441	441	445	445	445

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Figure 2: Partial effects of vote margin on any type of infrastructure project (fixed effects)



Source: Author

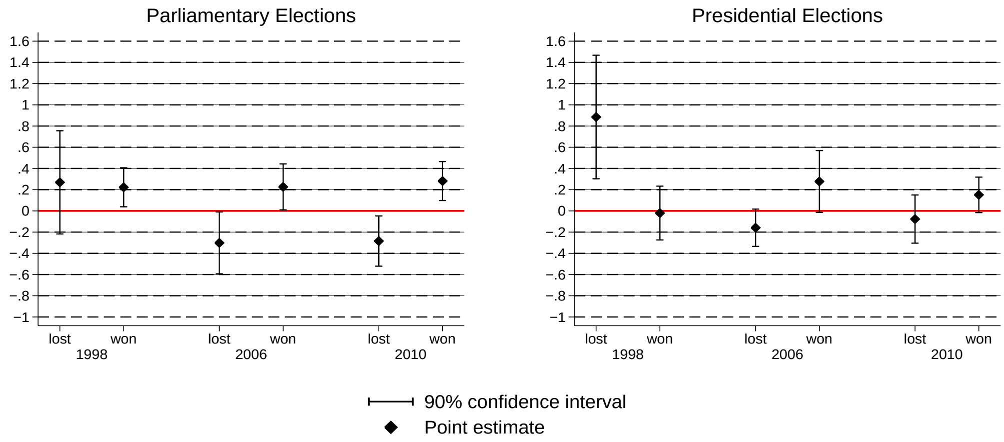
These results are broadly confirmed (albeit not for all three periods) by the (tobit) regression results for the three individual cross-sections with parliamentary and presidential vote margins (reported in Table D.1 in Appendix D) for which Figure 3 below shows the partial effects with 90 per cent confidence intervals.

For parliamentary elections, the results for 2006 and 2010 are clearly in line with the panel results, with vote margins in constituencies won being positive and significant, and negative and significant in those lost by the ruling MMD. For the earliest period (1996 elections / 1998 LCMS), however, this relation does not seem to hold. Although the partial effect of vote margins in parliamentary elections is still positive and significant for constituencies won in 1996, it is also positive but not statistically significant in constituencies lost. For presidential elections in 2006 and 2010, coefficients on vote margins also show the signs expected under the core-voter theorem, but they are statistically insignificant. The vote margin in constituencies lost in the 1996 elections, in contrast, is significant and with a positive sign, indicating disproportional infrastructure investment in opposition strongholds in the earliest period.

Against the background of Zambia's political history (briefly summarised in Appendix A), such a structural difference between the first and the two later periods would seem entirely plausible: prior to 2001, Zambia was a one-party-dominated state and the ruling MMD was not seriously challenged at the polls in the 1996 elections. In the absence of relevant democratic competition, there might have been no need for the government to use social and economic infrastructure provision to reward loyal constituencies or to try and win over swing voters in the earliest period; the extent of political targeting can thus be expected to differ between reporting periods.[39] Note, however, that this estimate is based on only 10 (non-urban) constituencies in which the MMD failed to secure a majority in the 1996 presidential elections and should thus be interpreted with caution.

39 In the 1996 presidential elections, the average lead over the strongest opposition candidate was 50.41 percentage points (with a majority in 140 out of the 150 constituencies). In comparison, in 2001 the average lead over the strongest opposition candidate was -5.35 percentage points (68 constituencies with a majority of votes for the MMD candidate) and 3.46 in 2006 (72 constituencies with an MMD majority).

Figure 3: Partial effects of vote margins in cross-sections



Source: Author

3.2 Urban and rural infrastructure

Taken together, these initial results suggest that, at least in the two later periods, public infrastructure provision in Zambia might have been subject to political targeting, and that this targeting indeed seems to have been in line with the core-voter rather than the swing-voter model, as suggested in the literature on neopatrimonial governance regimes.

However, the apparent heterogeneity across periods may not only be the result of changing government behaviour but could also point to a potentially important problem with the specification described by Equation 2, which arises from an uneven distribution of constituencies lost and won by the ruling party across district types over the three periods. This supposition is supported by the figures in Table 3, which show the number of constituencies won or lost by the MMD in parliamentary and presidential elections in 1996, 2001 and 2006 as well as their distribution across district types.

For one, as mentioned above, Table 3 suggests that the number of constituencies lost in the first period is potentially too small for any meaningful inference, based on the model described by Equation 2. More importantly, however, the numbers show that support for the ruling party is distributed unevenly across constituencies with different degrees of urbanisation. In particular, the MMD's support in urban areas shifted dramatically over time, with all 17 constituencies in city districts having been won in 1996, but all lost in 2006.

These marked differences indicate that the presented regression results might at least partly be driven by differential treatment of different constituency groups rather than election outcomes. For instance, the *won* dummy variable might pick up some effect linked to the apparent rural-urban divide in Zambia, which the included covariates only insufficiently control for. To rule this out, I run the same regressions in two sub-samples with rural / municipal and rural constituencies only. The panel results for these sub-samples (reported in Tables D.2 and D.3 in Appendix D and shown in Figure 4 below), however, show a pattern very similar to that of the full sample. For parliamentary elections, the signs on vote margins remain in line with the core-voter model, with vote margins in won constituencies being positive and significant in both sub-samples, and vote margins in constituencies lost being negative (although for the fixed effects model, this is only significant in the sample with only rural constituencies). The coefficients on presidential vote margins again have the signs expected under the core-voter model, but they are far from being statistically significant in any of the regressions.[40]

Table 3: Number of constituencies won by MMD or opposition by district type

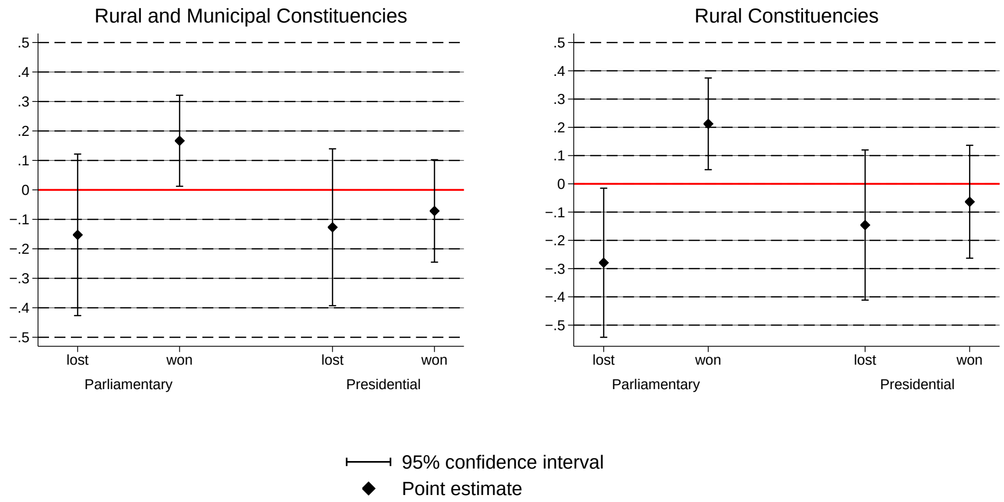
		Parliamentary			Presidential		
		Rural	Municipal	City	Rural	Municipal	City
1996	MMD	84	26	16	95	28	17
	Opposition	13	7	1	5	5	0
2001	MMD	51	15	11	46	14	8
	Opposition	49	18	6	54	19	9
2006	MMD	58	14	0	60	12	0
	Opposition	40	19	17	40	21	17

Data source: Electoral Commission of Zambia

Overall – although not fully conclusive in all specifications – these results provide no evidence in support of the swing-voter theorem in Zambia, but clearly support the core-voter model, based on parliamentary election results. Yet, there are reasons why the model described by Equation 2 might not fully capture the extent of political targeting of infrastructure investment, in particular for presidential elections. For one, the aggregate infrastructure variable might be inappropriate to fathom the true extent of political targeting if only certain sub-types of investment are subject to such targeting. Secondly, as argued in Section 2.2.2, the vote margin between the MMD candidate and the strongest opposition candidate might be an inadequate measure of electoral success if the government is interested in targeting infrastructure investment in such a way as to benefit the maximum number of its supporters. In this case, whether the opposition vote is concentrated on one or various candidates should be irrelevant for the government's allocation decision. Returning to the discussion in Section 2.2.2, because of the different electoral systems, the same goes if the government bases its allocation decisions on presidential rather than parliamentary votes.

40 For parliamentary elections, this general pattern is supported by individual cross-section regressions (reported in Tables D.4 and D.5 in Appendix D). However, the parliamentary vote margin is only significant for won constituencies in 2006 and 2010, and in lost ones only in 2006 in the rural-only sample. Presidential vote margins are insignificant (and signs are not throughout as expected), except for 1998 in the rural / municipal sample, where coefficients are significant on margin and won x margin, again with signs contrary to those expected under the core-voter model. Yet, as the very large confidence interval for the partial effect estimate shown in Figure E.1 in Appendix E suggests, the number of constituencies lost in 1996 is arguably too small for any meaningful inference.

Figure 4: Panel partial effects of vote margins in rural and municipal constituencies



Source: Author

3.3 Parliamentary or presidential elections?

Taking the second consideration into account first, in an alternative approach, I estimate a similar model to that described by Equation 2, but with the percentage share of votes received by the ruling party as the main explanatory variable. Since the findings above suggest that the relation between electoral success and infrastructure investment may have structurally changed over time, in addition to the time-fixed effects, I also include interaction terms between the vote share received by the ruling MMD and year dummies for the 2006 and 2010 reporting periods.

The econometric model for the panel estimation in this alternative specification then takes the form

$$\begin{aligned} share\_proj_{c,t} = {} & \alpha_t + \mu_c + \beta_1 \; vote_{c,t} \\ & + \beta_2 \; vote_{c,t} \times D_{2001} + \beta_3 \; vote_{c,t} \times D_{2006} \\ & + \delta \; z_{c,t} + \varepsilon_{c,d,t} \end{aligned} \tag{3}$$

where $vote_{c,t}$ is the share of votes cast in constituency c for the ruling MMD in elections in period t (parliamentary or presidential), β_1 is the effect of the vote share in 1996 elections on infrastructure provision in the 1998 reporting period, and $\beta_1 + \beta_2$ and $\beta_1 + \beta_3$ are the effect of vote shares in the "multi-party democracy" period's elections in 2001 and 2006 on reported infrastructure provision in 2006 and 2010, respectively.

To allow for a direct comparison of the results with those for relative majorities, instead of *vote* I also run all regressions with a variable $lead_{c,t}$ that gives the percentage point lead of the MMD's candidate over the strongest opposition candidate in constituency c in period t.[41]

41 Calculated as the difference of the vote share received by the MMD's candidate and the strongest opposition

Again, as a starting point, I estimate Equation 3 for parliamentary and presidential elections and any type of infrastructure project (i.e. construction or rehabilitation of roads, health or basic education facilities) in random and fixed effects panel specifications as well as in individual cross-sections for the three available periods.

Figure 5 shows the partial effects for the panel-fixed effects as well as the cross-section estimates for the MMD's percentage point lead and vote share in both parliamentary and presidential elections. In contrast to the results for vote margins, the panel estimates for Equation 3 (reported in Tables D.6 and D.7 in Appendix D) do not show any evidence of political targeting of infrastructure provision based on absolute or relative majorities in either parliamentary or presidential elections, with the coefficients on vote shares received by the ruling party's candidate as well as on the percentage point lead being insignificant in all specifications. The results from the individual cross-sections (reported in Tables D.8 and D.9 in Appendix D), in turn, support the findings for vote margins, suggesting that at least in the two later periods, public infrastructure provision might have been targeted in line with the core-voter theorem, with parliamentary elections being positive and significant for $lead$ in 2010 and for $vote$ in 2006, and presidential elections being significant in 2006 and 2010 for both $lead$ and $vote$.[42]

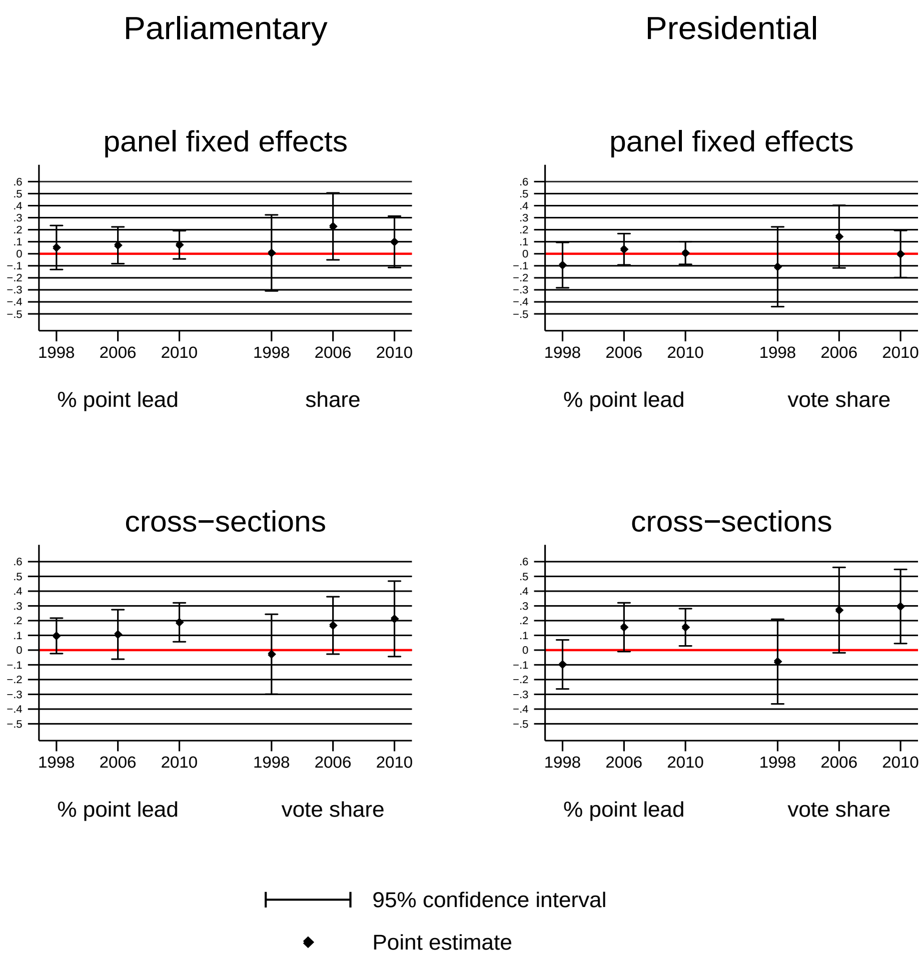
Also contrary to the results for absolute vote margins, the cross-section estimates for the model described by Equation 3 suggest that presidential election results explain differences in infrastructure provision somewhat better than parliamentary results, based both on absolute as well as relative majorities. This would be in line with the expectation formulated in Section 2.2.2 in view of the fact that in a neopatrimonial system such as Zambia's, decision-making powers are concentrated in the presidency. At the same time, the results give no indication as to whether the relative or absolute success in presidential elections is the better predictor of infrastructure provision.[43]

candidate, i.e. taking on negative values in constituencies lost by the MMD. Note that the two variables $vote$ and $lead$ are, of course, highly, but not perfectly, correlated, their difference being a measure of the concentration of opposition votes in one main opposition candidate. Especially in the more contested 2001 elections (see Section 2.2.2 and Appendix A.1), the two measures of electoral success differ sufficiently to suggest that indeed the variable choice might matter for the results, at least for parliamentary elections. The correlation coefficient for presidential elections between $vote$ and $lead$ is 0.98 in 1996, 0.91 in 2001 and 0.99 in 2006; for parliamentary elections the values are 0.95, 0.85 and 0.94.

42 As an alternative approach to test whether there is any evidence for the swing-voter theorem in the data based on absolute vote shares, I also include the squared vote share as an additional explanatory variable. If the government directed investment over-proportionally to more contested constituencies while spending less on relatively secure own strongholds and presumably harder-to-win opposition strongholds, then the relation between investment and vote shares could be expected to have an approximate inverse U-shape. In this case, the coefficient of the squared term in the regression should be statistically significant and have a negative sign. As it turns out, the square of vote shares is insignificant in all specifications for both presidential as well as parliamentary elections (results not reported).

43 The coefficients on $lead$ are naturally smaller than those on $vote$, given the different scale of the two variables ($lead$ theoretically ranges from -100 to 100, whereas $vote$ only from 0 to 100). However, based on Davidson-MacKinnon ("J-test") and Cox-Pesaran-Deaton (CPD) test statistics (see Baum 2006, 100f.), both models are essentially indistinguishable for presidential elections in this specification as well as in those following below. The CPD test rejects the $votes$ model in favour of the $lead$ model (when estimated as ordinary least squares (OLS) with uncorrected standard errors) at the 1 per cent level for the 1998 cross-section (for which both main explanatory variables are insignificant), but is insignificant in both other cross-sections. Performing the same test on a (OLS) pooled cross-section (with or without year interaction terms) including all three periods is insignificant. J-test statistics are also insignificant across individual and pooled cross-sections.

Figure 5: Marginal effects of vote share and percentage point lead (any project)



Source: Author

3.4 Rehabilitation and improvement versus construction

There are reasons, however, why the specification described above might still not pick up the full extent of political targeting of infrastructure investment.

Most importantly, as argued above, even if political targeting does occur, it is unlikely to affect all types of infrastructure projects aggregated in the dependent variable *share_proj* to the same degree. For one, allocation decisions for different types of investment or infrastructure in the individual sectors may be driven by different political rationales, for instance in reaction to different priorities and preferences by the electorate.[44] Secondly, the government's options and incentives to target allocations may be very different for investment in new infrastructure as

44 There is some indication in the LCMS data that the population attaches different levels of importance to different sectors. The survey contains a question on what projects households would like to see implemented in their constituency (see Section C). In the 2006 LCMS, for instance, 31 per cent of households named construction of a health facility as being among their first three priorities for projects they would like to see undertaken in their community, versus 8 per cent who wished for the construction of an education facility and a mere 3 per cent for building a road. In 2010, the respective shares were 30, 8 and 7 per cent.

opposed to improvement or rehabilitation of existing facilities. As the latter requires that some infrastructure already be in place, this should leave the government with less discretionary scope in its decisions about where to invest when improving or rehabilitating existing roads and facilities than when building new ones. Moreover, construction of new facilities might be more visible, and thus more politically attractive than improving existing facilities, which could be perceived by the local population as standard maintenance. Should this be the case, then any effect of electoral outcomes on the construction of new infrastructure might be swamped by untargeted, or only weakly targeted, rehabilitation and improvement investments. In both cases, the aggregate indicator for all types of infrastructure projects might fail to fully detect targeting of particular types of investment.

To account for the second potential problem first, I estimate the model described by Equation 3 separately for construction of new infrastructure and for improvement / rehabilitation of existing roads and health and education facilities. The cross-section results for vote shares in presidential elections (reported in Table 4) strongly support the proposition that political targeting of infrastructure investment occurs primarily in construction of new infrastructure, whereas improvement and rehabilitation of existing infrastructure would be expected to be less affected by such targeting. The estimates show a strong statistical dependence between the share of votes received by the ruling party in presidential elections and construction of new roads, health facilities or basic schools in the period following these elections. In contrast, the coefficient on improvement / rehabilitation of existing roads and facilities is insignificant in all periods.

Remarkably (but not particularly surprising, given the results for vote margins above), the 1998 cross-section for new infrastructure construction yields a significant negative coefficient on MMD votes, suggesting that a higher vote share for the ruling party in the 1996 presidential elections was associated with below-average construction of new infrastructure reported in the 1998 LCMS.[45] Again, the results for the MMD candidate's percentage lead (reported in Table D.10 in Appendix D) are highly similar, with the same signs and significant coefficients at the 1 per cent level in all three periods.[46]

The effect for 2006 and 2010 is not only highly significant, but arguably also fairly substantial: a one percentage point increase in the MMD's vote share increases the share of households reporting any infrastructure construction by more than .4 percentage points in each period. An increase in the MMD's vote share by one standard deviation, with all other variables held constant, increases the share of households reporting construction by .40 standard deviations in 2006 and .48 standard deviations in 2010. In comparison, a one percentage point increase in the poverty headcount increases the share of households reporting at least one construction project by .06 percentage points in 2006 and .07 in 2010, with a one standard deviation increase in the poverty headcount increasing the share of households by .06 standard deviations in 2006 and .09 in 2010.

45 While in line with the results for vote margins reported above, and arguably consistent with the suggestion that the political economy of infrastructure provision would have been fundamentally different prior to the introduction of multi-party democracy at the turn of the millennium, this negative coefficient is not robust against excluding some of the control variables (see Table D.31 in Appendix D). Robustness checks are briefly discussed below.

46 As before, both models have comparable explanatory power. Neither a J-test nor a CPD test is able to distinguish between the model with presidential *lead* or *vote*, rejecting both null-hypotheses, possibly as a result of the small number of observations (for a discussion of the tendency of these tests to over-reject the null in small samples, see Rao, Ghali and Krieg (2008).

Table 4: Vote shares and infrastructure improvement or construction: presidential elections

	1998		2006		2010	
	impr	built	impr	built	impr	built
votes MMD	.069	–.265**	.177	.426***	.113	.418***
	(.18)	(.12)	(.14)	(.14)	(.12)	(.10)
city	–.636	–12.896	–19.388**	–1.925	6.482	5.165
	(16.39)	(9.12)	(8.31)	(6.22)	(6.35)	(5.06)
municipal	7.246	–9.739***	–10.549***	–.909	–5.367*	–6.320**
	(6.09)	(3.58)	(3.62)	(4.06)	(3.23)	(2.89)
access transport	–2.201**	–1.049***	–.116	.059	–.597*	–.213
	(.91)	(.40)	(.17)	(.10)	(.35)	(.55)
access health	6.606	–2.492	.016	–.676**	–.166	–.525
	(8.42)	(8.23)	(.28)	(.27)	(.62)	(.50)
access education	.929	–.278	–.864	1.138*	.575	–.614
	(1.35)	(1.08)	(.73)	(.68)	(.90)	(1.29)
sqrt pop	.049	.085**	–.041**	.024	–.031	–.007
	(.07)	(.04)	(.02)	(.02)	(.02)	(.02)
pop density	.005	–.000	–.001	–.004	–.004	.000
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	.003	–18.143*	.246**	.062	.154	.073
	(18.22)	(10.66)	(.12)	(.08)	(.11)	(.11)
Provinces						
Central	–22.801**	11.071	42.176***	18.464*	31.406***	–5.338
	(10.23)	(8.78)	(11.92)	(10.97)	(11.05)	(9.69)
Copperbelt	–11.158	21.187*	34.472***	18.469*	26.497**	–1.224
	(9.28)	(10.78)	(8.79)	(10.93)	(11.88)	(10.62)
Eastern	16.528*	29.453***	35.628***	9.617	37.591***	34.020***
	(9.91)	(6.13)	(6.75)	(7.40)	(12.81)	(8.69)
Luapula	–8.023	20.435**	43.142***	21.801*	48.259***	14.397
	(9.00)	(9.44)	(11.69)	(11.99)	(11.18)	(10.36)
Lusaka	20.904	41.719***	37.265***	17.397*	30.213*	25.470**
	(14.86)	(8.64)	(12.06)	(9.72)	(16.28)	(11.53)
Northern	–6.832	14.015*	32.062***	27.553**	49.972***	23.933***
	(6.90)	(7.95)	(6.47)	(10.72)	(9.83)	(8.25)
North-Western	–1.236	13.199***	–13.664*	3.086	16.965**	–10.234
	(7.37)	(4.29)	(7.75)	(9.22)	(7.86)	(25.39)
Southern	–9.178	9.372	48.628***	20.903*	26.616**	10.613
	(12.05)	(10.20)	(11.25)	(10.61)	(12.29)	(9.68)
Language Groups (≥ 30 %)						
Bemba	15.548***	1.836	–17.554***	–23.426**	–11.389	15.466**
	(5.88)	(6.05)	(6.10)	(9.21)	(7.00)	(7.78)
Tonga	12.991	6.530	–28.075***	–12.586	.949	22.121**
	(9.14)	(7.65)	(10.10)	(9.93)	(10.41)	(9.51)
North-Western	6.608	7.840*	37.249***	–.804	3.918	25.114
	(4.92)	(4.46)	(7.85)	(10.11)	(11.59)	(26.13)
Nyanja	–10.127	–20.083***	3.502	4.679	.312	–8.670
	(9.88)	(6.08)	(4.83)	(5.00)	(8.47)	(5.43)
Constant	25.051	26.379**	17.001	–6.846	11.871	–13.881
	(19.01)	(11.22)	(12.26)	(9.10)	(15.32)	(11.98)
N	146	146	149	149	150	150

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses

In turn, while the cross-section results for parliamentary elections (Tables D.11 and D.12 in Appendix D) also support the general finding that there is a positive relation between electoral success of MMD candidates and construction of new infrastructure in the 2006 and 2010 reporting periods,[47] comparison with the estimates for presidential elections corroborates the conclusion that – at least when measured in absolute vote shares – presidential election results are more important for political targeting of infrastructure construction than parliamentary ones. Whereas the coefficients for the MMD vote share in the 2006 and 2010 cross-sections

47 As with presidential elections, there is no statistically significant correlation between electoral success of the ruling party and reported investment in improvement or rehabilitation of existing infrastructure, except in the 1998 reporting period, for which the coefficient on *lead* is positive and significant at the 10 per cent level.

are also positive and statistically significant (although insignificant for 1998), they are roughly between two-thirds and three-quarters of the magnitude of those for presidential elections. A one standard deviation increase in the MMD's share of parliamentary votes increases the share of households reporting infrastructure construction by .26 (2006) and .29 (2010).[48]

As a robustness check, I run the same cross-section regressions for presidential vote shares and construction of new infrastructure in a number of specifications without language group and province controls and with a set of alternative controls described in Section C, including language group percentage shares instead of 30 per cent dominance dummies, and distances to the national and provincial capital instead of province dummies. The results (reported in Tables D.31–D.33 in Appendix D)[49] show that the positive and significant coefficients on the MMD's vote share received in the 2001 and 2006 presidential elections (Tables D.32 and D.33) are highly robust to excluding and including different control variables.[50] Moreover, the estimates for the 2010 LCMS are also highly robust to using 2008 instead of 2006 presidential election results, which produces very similar significance levels and coefficients on the presidential vote share (see Table D.34 in Appendix D). For the specification reported in Table D.11 for instance, using the MMD vote share in 2008 yields a coefficient .404 instead of .418 for 2006 (both significant at the 1 per cent level) for construction of new infrastructure.[51]

The panel estimates from separate regressions for improvement / rehabilitation and construction (reported in Tables D.13 and D.14 (presidential), and D.15 and D.16 (parliamentary) in Appendix D) also support the hypothesis that political targeting affects primarily construction

48 Directly testing the models with parliamentary elections against those with presidential elections (estimated as OLS with uncorrected standard errors) in each cross-section based on J-test and CPD test statistics (see Baum 2006, 100f.) strongly supports this conclusion. Testing the model with vote shares received in presidential elections against that with vote shares in parliamentary elections for each cross-section rejects the parliamentary model at the 10 per cent (J-test) and 1 per cent levels (CPD) in 2010, and at the 10 per cent and 5 per cent levels in 2006. In 1998 the CPD test rejects the parliamentary model in favour of the presidential one at the 1 per cent level, whereas the J-test is inconclusive. For the *lead* variable, the evidence is less conclusive in this regard, with coefficients for presidential and parliamentary elections in 2001 and 2006 being of similar magnitude, and the parliamentary one being slightly larger than the presidential one in 2006 (.258 versus .236), but slightly smaller in 2010 (.221 versus .224). Comparing the presidential and parliamentary models with the *lead* variable rejects the parliamentary specification at the 10 per cent (J-test) and 1 per cent levels (CPD) in both 2010 and 1998, whereas in 2006 the CPD test rejects the presidential model at the 10 per cent level. The J-test is inconclusive. The same tests run in a pooled cross-section that includes all three periods reject the model with parliamentary votes at the 10 per cent and 1 per cent level respectively (vote shares); for vote lead, the CPD test rejects the parliamentary model at 5 per cent, whereas the J-test is inconclusive (p-value of .105). Vice versa, no test rejects the model with presidential votes in favour of the parliamentary model in the pooled cross-section.

49 For ease of comparison, the results shown in Table 4 are reproduced in column (2) in Tables D.31–D.33

50 In addition to the reported regressions, all models were also estimated with the additional / alternative controls for need or preferences for health or education infrastructure discussed in Section C (share of households expressing preference for health or education facility construction and/or improvement; under-five mortality as a measure of health service deprivation). To address multicollinearity in some of the controls, I also replace population density with the district surface area. None of these additional or alternative variables are significant in any of the specifications, and their inclusion does not alter the coefficients on vote share in any substantive way (results not reported). The same robustness checks conducted for the *lead* model (not reported) yields highly similar results.

51 In principle, 2008 election results would be preferable to the 2006 results for the 2010 cross-sectional analysis, as the time gap between elections and the LCMS reporting period is much smaller. In the interest of comparability of results throughout the paper, however, 2006 election results are used for the cross-section regressions throughout. In view of the similarity of the estimates reported in Tables D.33 and D.34, this seems permissible.

of new infrastructure. Whereas for improvement / rehabilitation the coefficients on *lead* and *vote* are insignificant throughout all specifications for both parliamentary as well as presidential elections, for construction of new infrastructure the interaction term of parliamentary *lead* with the 2010 reporting period dummy is positive and (weakly) significant for parliamentary elections in the (tobit and GLS) random effects models.[52] For presidential elections, both (*lead* and *vote*) interaction terms with the 2010 dummy are positive and significant in the random effects models.

The fixed effects models, however, do not yield significant coefficients on any of the explanatory variables of interest.[53] This suggests that either there is simply insufficient variation of the main variables within groups across periods, or that the random effects and cross-section results are driven by some unobserved characteristics of constituencies that are insufficiently controlled for with the included covariates but are absorbed by the constituency-fixed effects.

This issue is taken up further down. First, however, coming back to the argument that the extent of political targeting might not only differ with respect to improving existing infrastructure or providing new infrastructure but also might differ between different sectors, in order to better understand how investments in each sector drive the results for the aggregate infrastructure measure, I estimate the same models as above separately for infrastructure in each sector (roads, health, education).

The results (shown in Tables D.17–D.22 in Appendix D) clearly support the findings for the aggregate infrastructure indicator of a positive relation between electoral success of the ruling party and infrastructure provision. Moreover, the estimates for the 2006 and 2010 reporting periods indicate that the argument that construction of new facilities should be more prone to political targeting than improvement / rehabilitation of existing facilities applies in all three sectors. Whereas the MMD's vote share and percentage point lead is (positively) significant for construction for all three types of infrastructure in both periods (except for roads in 2006), it is significant in only two out of the six reported cross-sections for improvement / rehabilitation (roads in 2010, education in 2006). Most notably, for these periods there is no evidence that the results for the aggregate indicator are driven exclusively by any one sector in particular, although there are marked differences, with the effects being strongest for basic education and weakest for roads.

Differing from the results for the aggregate dependent variable, in the earliest period all coefficients on *vote* and *lead* are insignificant for individual sector investment, except for construction of basic education facilities, for which they are negative and significant, suggesting that it is only school infrastructure that drives the somewhat counterintuitive results for the aggregate indicator for the first period.[54]

Considering that the scope for new infrastructure construction (and thus political targeting of this type of investment) can be expected to be rather limited in urban areas, where more infras-

52 For the *lead* variable, the 2006 interaction is also positive and significant at the 10 per cent level for parliamentary elections in the GLS random effects specification.

53 Limiting the panel to the two later periods, which is equivalent to estimating first differences, does not change this.

54 Note that, overall, the reported level of infrastructure investment is quite low in the first period, with 82 constituencies reporting no building of new roads at all, 44 no construction of health facilities and 41 no basic schools.

tructure exists already,[55] as before, I restrict the sample to constituencies located in rural and municipal and only rural districts. The cross-section results are fairly robust to restricting the sample in this way (marginal effects shown in Figure 6) but suggest an interesting dynamic: whereas the coefficients on *vote* and *lead* in the municipal / rural sample are comparable to those in the full sample, in the sample with only rural constituencies the coefficient in 2010 is larger than in the full sample, whereas it is smaller in 2006.[56] Although these estimates are obviously imprecise and should not be over-interpreted, this tendency would be in line with the observation that political support for the MMD has, over time, increasingly become concentrated in rural areas (see Table 3). One might therefore expect any political targeting to concentrate on rural constituencies as well.

A similar pattern can be observed in the panel estimates, with the random effects model producing significant negative coefficients on *vote* and *lead* in 1998, insignificant ones in 2006 and positive ones in 2010, all of which are somewhat larger in the rural / municipal sample, and substantially larger in the rural-only sample than in the full sample.[57] In the fixed effects model (partial effects shown in Figure E.2 in Appendix E), however, the coefficients for the two later periods – while significantly different from that in the earliest period and with a positive sign in the rural-only sample – are still not significantly different from 0.

None of the individual sector and sub-sample regressions give any more indications as to whether absolute or relative majorities matter more for allocation decisions.[58]

Taken together, these results thus suggest six preliminary conclusions: first, there is evidence that the provision of economic and social infrastructure in Zambia has indeed been subject to political targeting in the past; second, the nature and extent of this political targeting seems to have changed fundamentally with the introduction of genuine "multi-party democracy" ahead of the 2001 elections, when electoral success and infrastructure provision appear to have been positively correlated; third, there is support for the hypothesis that this political targeting affected primarily construction of new infrastructure, whereas rehabilitation and improvement of existing roads and facilities seems to have been affected less by such targeting; fourth, and possibly as a consequence of the latter, political targeting – at least in the latest period – seems to have occurred primarily in rural rather than urban constituencies; fifth, basic education infrastructure appears to be the most strongly targeted, followed by health, arguably ahead of roads; and sixth, electoral success in presidential elections appears to be more important for the government's allocation decisions than parliamentary election results.

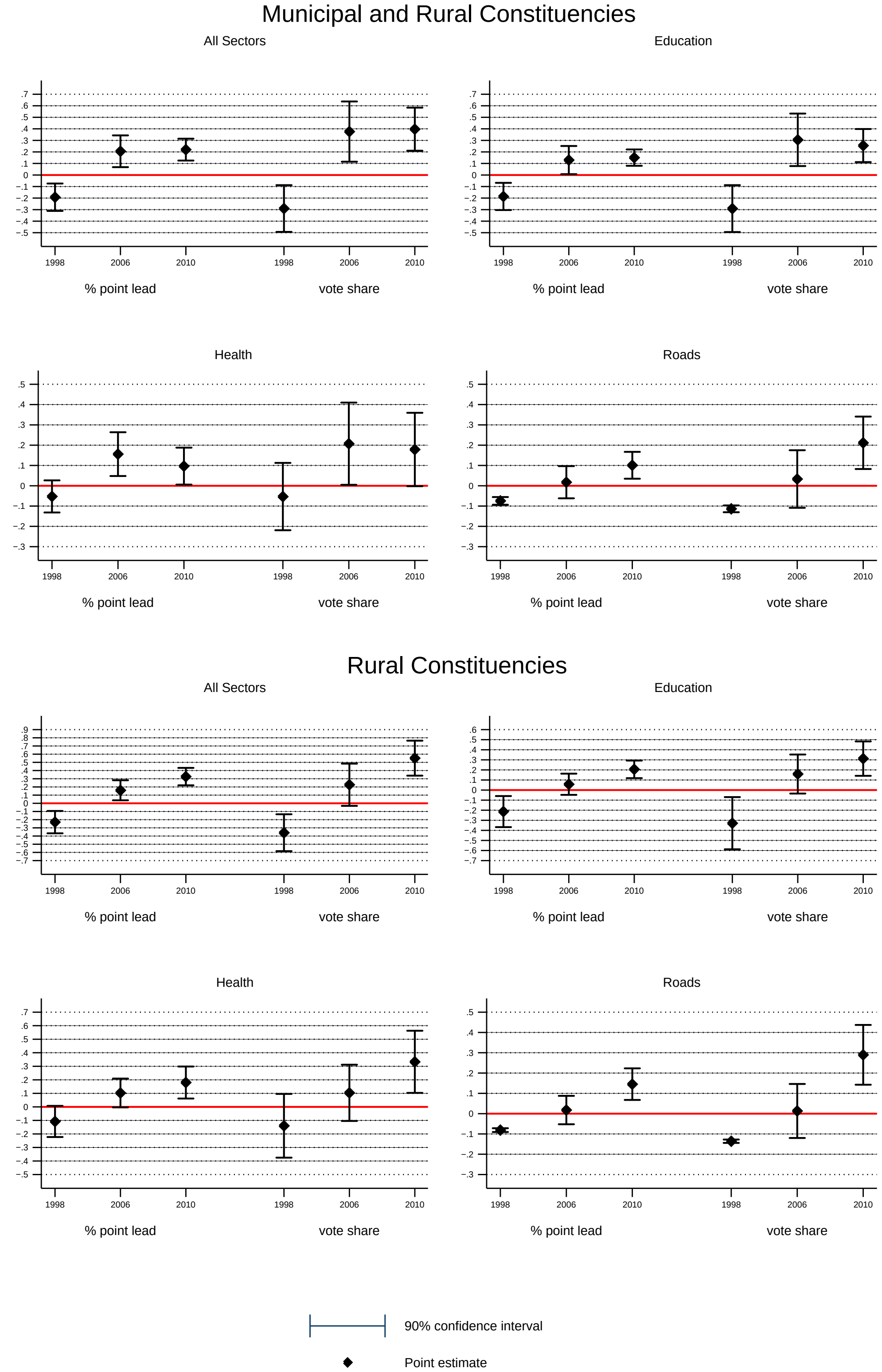
55 As discussed above, it might be expected that in urban areas with much more existing infrastructure, the predominant investment is rehabilitation or improvement of existing roads and facilities rather than construction of new ones, whereas in rural areas, where infrastructure is still scarce, construction of new facilities should be more frequent. Although the city dummy variable is not significant in most specifications, the negative and mostly significant dummy on municipal districts would support this hypothesis.

56 Estimates reported in Tables D.23–D.26 in Appendix D.

57 Tables D.27–D.30 in Appendix D report the results for rural and municipal constituencies for the *lead* and *vote* dependent variables.

58 Both the Davidson-MacKinnon and Cox-Pesaran-Deaton tests of the *lead* model against the *vote* model for presidential elections are inconclusive, with both test statistics being insignificant in all periods, except 1998 and 2010, when the CPD test statistic rejects the *vote* model at the 5 per cent level. A comparison of the R^2s for the OLS regressions with construction in the full sample suggests that the difference between the two models accounts for less than 1 per cent of the variation in the dependent variable in each period. In other words – although there is strong evidence that presidential elections matter more for infrastructure targeting than parliamentary elections – with the available data it does not seem possible to distinguish between the two models based on vote shares or percentage-point lead.

Figure 6: Cross-section marginal effects of presidential vote share and % point lead on construction in rural and municipal constituencies



Source: Author

At the same time, with the data available, it does not seem possible to decide whether the government bases its allocation decisions on absolute or relative majorities in presidential elections, with both performing equally well as predictors of infrastructure construction.[59] Given these conclusions and based on the theoretical considerations discussed in Section 2.2.2, for the remaining robustness checks, I limit the analysis to presidential vote shares.

3.5 Threshold effects

Of course, positive coefficients on the *vote* (and *lead*) variable are not exclusively compatible with the core-voter model alone. In principle, it would also be conceivable that the government mixes the two strategies by disproportionately benefiting both swing and core constituencies, and penalising opposition strongholds; although distinguishing between the two strategies would be difficult, both conceptually as well as empirically, unless targeting occurred only above or below some clear thresholds of voter support. To check for such threshold effects in the government's allocation decision, I construct a number of dummy variables that identify constituencies as government strongholds if the vote share received by the ruling party in presidential elections is above a certain threshold and regress the share of households in a constituency reporting infrastructure construction on these dummies (and the same control variables included in the previous regressions).

Limiting the analysis to the two multi-party elections in 2001 and 2006, of all tested thresholds, a 40 per cent MMD vote dummy seems to work best, splitting the sample into what would seem to be a reasonable number of (government) stronghold and non-stronghold constituencies in 2001 and 2006 (see Table 5). For the 1996 elections, this formulation clearly makes little sense, with the MMD having received at least 40 per cent of the vote in 138 out of 150 constituencies.

However, as Table 5 also shows for the two later periods, when using this measure of electoral success, the rural / urban divide becomes even more pronounced than with vote shares, as there is only one constituency in a city district (Wusakile in Copperbelt province) where the MMD received more than 40 per cent of the vote in 2001, and none in 2006. Again, this uneven distribution of strongholds across different types of constituencies risks falsely attributing variation in infrastructure provision to the stronghold dummy in case there is some rural-urban divide factor not captured by the control variables.

Table 5: 40% MMD strongholds by district type

	Presidential			
	1996	2001	2006	out of
City	17	1	0	17
Municipal	27	12	14	33
Rural	94	36	62	100
total	138	49	76	150

Source: Author, based on data provided by ECZ

59 As a matter of fact, it is not improbable that the government itself does not distinguish between the two measures of electoral success, given their high correlation for presidential elections.

To eliminate this risk, I once more restrict the sample to constituencies in municipal and rural districts. Table 6 shows the results for the 40 per cent MMD dummies for the two later cross-sections.

The estimates suggest that only construction of basic education facilities was clearly targeted in both periods in constituencies where the MMD received at least 40 per cent of the vote in the preceding presidential elections, whereas for health facilities there is evidence for such targeting only in 2010. For roads construction there is no evidence for political targeting of party strongholds in either period. The effect for health and education in 2010, however, is rather substantial: being a 40 per cent government "stronghold" increases the share of households in a constituency reporting construction of a health facility by 16.23 percentage points, and the share of households reporting construction of a basic education facility by 10.74 percentage points; or, in the alternative interpretation: being a 60 per cent opposition stronghold reduces the share of households reporting infrastructure investment by these amounts.[60]

These estimates are, however, highly sensitive to even small changes of the chosen thresholds,[61] and overall, there is no compelling evidence indicating that threshold effects would perform better than vote shares at explaining the targeting of infrastructure construction. The results thus suggest that targeting is not restricted exclusively to particularly pronounced party strongholds, but rather follows a more continuous pattern, in which a higher vote share for the ruling party is rewarded with more investment in new infrastructure.

This notwithstanding, the findings for vote thresholds clearly add to the evidence in support of the core-voter and against the swing-voter model for Zambia.[62] Yet, there are a number of reasons why the presented estimates might be biased. These are addressed in the remainder of this paper.

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60 Ultimately, the question of whether the government's rationale is to penalise constituencies where more than 60 per cent of voters support the opposition, or reward constituencies where it knows that at least 40 per cent of voting households form part of its support base, cannot be answered based on available data; it is partly a question of semantics rather than empirics, boiling down to the question of how one defines "core voters" and government or opposition "strongholds". Nonetheless, it is not inconceivable that an incumbent government, whose goal it is to increase its chances to stay in office, would pursue such a penalising strategy in order to weaken opposition candidates or attempt to "bully" opposition voters to switch sides. Alternatively, the strategy could be to create a "deterrent" for only weakly loyal supporters not to switch sides to the opposition, although this rationale would be fairly demanding with respect to the voters' level of information about country-wide allocation patterns.

61 Lowering the MMD vote threshold to 35 per cent, for instance, renders roads in 2010 and health in 2006 significant, but all others insignificant. Raising it to 45 per cent increases the coefficient on any construction in 2010 slightly but renders education in 2006 insignificant and roads in 2006 negative and significant at the 10 per cent level. Increasing the threshold for MMD vote beyond 60 per cent does not yield significant coefficients, nor does decreasing it below 30 per cent.

62 Running the same regressions with dummies for vote margins within a 10 or 20 per cent caliper does not yield any significant coefficients except for health in 2006 with the 10 per cent vote margin dummy (positive and significant at the 5 per cent level).

Table 6: Presidential strongholds and infrastructure construction: rural constituencies

	2006				2010			
	any	roads	health	education	any	roads	health	education
40% MMD	3.56	–.28	2.20	5.65**	17.80***	3.18	16.23***	10.74***
	(3.58)	(2.15)	(2.96)	(2.49)	(4.42)	(2.79)	(5.32)	(3.59)
access transport	–.08	–.19**			–.26	.04		
	(.10)	(.09)			(.64)	(.25)		
access health	–.24		–.02		–.40		–.78**	
	(.26)		(.22)		(.56)		(.36)	
access education	.83			.34	–.66			.07
	(.72)			(.52)	(2.02)			(1.29)
sqrt pop	.02	.01	.03	.02	–.00	.03***	.01	.02
	(.02)	(.01)	(.02)	(.02)	(.03)	(.01)	(.02)	(.02)
pop density	–.17	–.11*	–.07	–.13	–.09	–.04	.00	–.18*
	(.14)	(.06)	(.09)	(.13)	(.15)	(.09)	(.14)	(.11)
poverty	.17	–.03	–.02	.19*	.08	–.01	.10	–.01
	(.12)	(.06)	(.10)	(.10)	(.14)	(.07)	(.10)	(.11)
Provinces								
Central	.95	–6.51	4.68	.77	–6.70	–3.99	1.71	19.45*
	(11.10)	(6.04)	(10.23)	(6.68)	(11.93)	(8.94)	(8.68)	(10.09)
Copperbelt	11.35	–6.19	11.95	10.71	–4.14	6.73	–12.18	23.37*
	(10.27)	(5.85)	(10.68)	(6.68)	(15.14)	(9.66)	(10.56)	(13.44)
Eastern	11.60	–.65	1.42	16.13**	27.73***	12.48*	17.01	32.22***
	(9.94)	(5.11)	(5.57)	(6.44)	(9.49)	(6.58)	(10.78)	(7.37)
Luapula	15.85	–8.43	4.14	17.90**	13.29	1.58	11.18	40.22***
	(11.10)	(5.88)	(9.80)	(7.78)	(12.87)	(8.70)	(10.12)	(11.61)
Lusaka	13.63	–1.10	8.75	12.71	19.66	16.03**	9.44	28.83***
	(11.14)	(5.75)	(7.31)	(8.35)	(13.26)	(7.79)	(10.60)	(10.85)
Northern	16.58*	–7.93	12.00	16.81***	18.57*	7.24	13.02	33.01***
	(9.34)	(5.51)	(8.33)	(6.33)	(10.49)	(7.99)	(9.01)	(10.03)
North-Western	6.86	–1.57	–1.26	5.92	–10.45	14.61**	–12.11	–3.91
	(9.62)	(3.51)	(8.63)	(5.74)	(26.03)	(7.22)	(11.01)	(21.94)
Southern	4.20	–8.29	4.28	10.13	5.94	–.13	5.19	30.28***
	(12.02)	(6.11)	(11.72)	(7.55)	(13.95)	(9.58)	(10.31)	(10.53)
Language Groups ($\geq$ 30 %)								
Bemba	–4.41	2.99	–8.80	–1.93	19.77**	9.29	3.26	6.95
	(5.80)	(3.59)	(7.22)	(4.69)	(9.14)	(6.55)	(6.41)	(9.46)
Tonga	4.02	2.89	–2.90	5.22	21.95*	15.05*	10.59	4.87
	(8.85)	(3.39)	(10.63)	(4.75)	(12.27)	(8.23)	(9.21)	(8.97)
North-Western	–1.33	–1.27	3.66	4.22	27.09	4.27	10.48	35.07
	(11.20)	(5.43)	(8.37)	(7.22)	(26.55)	(7.33)	(12.23)	(22.60)
Nyanja	4.53	–1.08	5.18	2.77	–5.10	–2.95	–9.04	1.28
	(6.05)	(3.55)	(3.88)	(3.24)	(6.56)	(3.71)	(6.29)	(4.63)
Constant	–3.70	9.54	3.05	–21.09*	–4.28	–16.08**	–12.26	–23.40*
	(11.45)	(6.52)	(10.32)	(10.83)	(17.02)	(7.70)	(12.84)	(13.14)
N	99	99	99	99	100	100	100	100

Significance levels: $*$: 10% $**$: 5% $***$: 1%; Clustered standard errors in parentheses

4 Addressing possible sources of bias

There are a number of potential sources of bias that might affect the presented regression results, above all: reverse causation; measurement error in the dependent variable; reporting error in the survey data; and a possible sample selection problem.

These possible problems are taken up in sequence in the subsequent sections. In the interest of readability and focus, however, I limit the further analysis in a number of ways: first, although the results for the earliest reporting period are potentially interesting and the political economy of public expenditure in the absence of serious challenges to the incumbent government might deserve further investigation, this is beyond the scope of this paper, which is primarily interested in political targeting of public expenditure in the presence of democratic competition in hybrid neopatrimonial systems. Given this, and the fact that neither of the proposed panel estimators is fully appropriate to account for the structure of the data, I limit the further analysis to the 2006 and 2010 reporting period cross-sections. In view of the findings and discussion above, I further limit the analysis to infrastructure construction and run all regressions only for vote shares in presidential elections (and dummies constructed from these).

4.1 Reverse causality

Evidently, the estimates reported in the previous sections could suffer from a simultaneity bias, resulting from reverse causality if constituencies that receive higher shares of infrastructure investment have done so already in the past and, as a reaction, a higher proportion of these constituencies' populations then voted for the ruling party.[63]

The textbook approach to deal with this problem (as well as the other possible sources of bias discussed here) would be to identify one or various instrumental variables that are correlated with the main explanatory variable (MMD vote share) but have no independent influence on the outcome variable. Unfortunately, most of the variables that, in other contexts, would be obvious candidates for instruments for the electoral success of the ruling party, such as the geographic location, poverty profile or ethnic composition of constituencies, are ruled out as valid instruments because they are expected to directly affect not only voting behaviour but also the government's investment decisions (which is why they were included in the above regressions in the first place).

However, should the reverse causality hypothesis be correct, then the MMD's electoral performance in a given period should be (positively) correlated with infrastructure provision in the past. In this case, past infrastructure provision could serve as an instrument for the MMD vote share.

Unfortunately, a simple OLS regression of the MMD vote share in presidential elections on the reported construction of infrastructure in the preceding period (as well as those control variables that can be expected to affect voting behaviour) suggests otherwise: for infrastructure construction reported in the 2006 LCMS, there is no statistically significant effect on the MMD's vote share in the presidential elections of 2006 or 2008.[64] For the 2001 elections, the

63 See Magaloni (2006) for a more extensive discussion of this reverse-causation problem.

64 Elections in 2006 were held on September 28. Infrastructure projects reported in the 2006 LCMS should thus precede these elections. For robustness, I also use vote shares received by the MMD's Rupiah Banda in the 2008 emergency presidential elections, which became necessary after President Levy Patrick Mwanawasa

estimates even suggest a (weakly significant) negative effect of infrastructure construction on the MMD candidate's performance at the polls. Only for the 2011 presidential elections (which the MMD lost to the opposition Patriotic Front) is there a (weakly significant) positive correlation between construction reported in the 2010 LCMS and the MMD's vote share (see columns 1, 3, 5 and 7 in Table 7).

Table 7: Determinants of presidential electoral success

	2001		2006		2008		2011	
Construction	–.074*		.048		.006		.096*	
	(.04)		(.07)		(.06)		(.05)	
Δ km transport				–.021		–.089		.099
				(.09)		(.08)		(.16)
Δ km health		–.294**		.260*		.040		.073
		(.12)		(.15)		(.15)		(.22)
Δ km education		–.323		–.278		.141		.319
		(.42)		(.50)		(.46)		(.47)
Municipal	–6.233***	–5.144***	–5.548*	–5.951*	–4.933*	–4.775*	–6.543**	–7.286**
	(1.72)	(1.60)	(3.19)	(3.24)	(2.75)	(2.83)	(2.99)	(3.02)
City	–14.147***	–12.381***	–23.095***	–23.424***	–17.350***	–17.034***	–20.995***	–21.921***
	(2.80)	(2.90)	(5.55)	(5.90)	(4.69)	(4.87)	(4.72)	(4.83)
poverty	.082*	.056	.263***	.267***	.254***	.260***	.060	.079
	(.05)	(.05)	(.07)	(.07)	(.07)	(.07)	(.13)	(.13)
Provinces								
Central	10.841**	7.775*	24.989***	24.858***	20.131***	20.902***	45.019***	45.653***
	(5.36)	(4.68)	(6.74)	(6.83)	(6.79)	(6.62)	(7.87)	(8.06)
Copperbelt	19.995***	18.047***	16.845**	18.066**	14.880*	15.663**	35.200***	35.192***
	(5.27)	(4.70)	(7.43)	(7.84)	(7.65)	(7.59)	(8.75)	(8.58)
Eastern	–11.409**	–11.873**	–32.525***	–31.465***	–5.888	–4.079	24.879***	25.666***
	(4.76)	(5.06)	(6.47)	(7.37)	(5.31)	(5.06)	(7.50)	(7.48)
Luapula	23.069***	21.152***	–7.689	–7.316	–4.123	–3.709	22.485***	23.602***
	(5.49)	(5.11)	(7.41)	(7.24)	(7.21)	(6.88)	(8.58)	(8.49)
Lusaka	.851	–1.393	–4.121	–2.842	–7.869	–6.557	14.282*	15.633*
	(5.65)	(5.29)	(7.66)	(8.07)	(7.02)	(6.86)	(7.63)	(8.05)
Northern	12.546***	10.766**	–2.917	–1.263	–10.089*	–9.278*	20.453***	21.780***
	(4.72)	(4.26)	(5.71)	(5.82)	(5.72)	(5.08)	(7.64)	(7.45)
North-Western	10.228	9.107	10.259	10.185	5.144	6.136	26.887**	27.183***
	(6.90)	(5.94)	(8.74)	(7.19)	(8.89)	(8.97)	(11.29)	(10.31)
Southern	9.490	5.892	6.634	8.596	1.133	1.874	24.310***	27.007***
	(7.93)	(6.72)	(9.93)	(10.08)	(9.73)	(9.39)	(9.10)	(9.34)
Language Groups (% share)								
Bemba	.016	.040	–.348***	–.348***	–.340***	–.348***	–.359***	–.356***
	(.04)	(.04)	(.05)	(.05)	(.04)	(.04)	(.07)	(.07)
Tonga	–.254***	–.224***	–.731***	–.741***	–.567***	–.574***	–.496***	–.520***
	(.08)	(.07)	(.11)	(.11)	(.10)	(.10)	(.10)	(.10)
North-Western	–.059	–.049	–.176	–.174*	–.149	–.163	–.113	–.105
	(.09)	(.08)	(.12)	(.10)	(.11)	(.11)	(.14)	(.13)
Nyanja	.000	.015	–.007	–.007	.149***	.131***	.148**	.149**
	(.04)	(.05)	(.06)	(.07)	(.04)	(.04)	(.07)	(.07)
Constant	24.463***	22.706***	57.735***	57.586***	50.771***	50.500***	30.654**	30.744**
	(5.03)	(4.92)	(7.70)	(7.86)	(7.10)	(7.16)	(12.91)	(12.81)
N	149	146	150	149	150	149	150	149

Significance levels: * : 10% ** : 5% *** : 1%
Robust standard errors in parentheses

died on August 19 of the same year.

Alternative candidates for instrumental variables in the same line of argument would be the improved access to infrastructure measure discussed in Section 2.2.1 (putting the suspected measurement errors aside), calculated as the reduction in average distance to a facility between two surveys prior to the elections of interest. However, reductions in distance to the nearest transport, health and basic education facilities do not perform significantly better in predicting electoral success of the MMD in presidential elections (columns 2, 4, 6 and 8 in Table 7).[65] Only improved access to health infrastructure is statistically significant, yet with a negative sign in the earlier period and a positive sign in the later period.[66]

Given these weak results from OLS regressions, it is no surprise that none of these suggested instruments (or combinations thereof) pass (under-)identification tests when plugged into an IV regression (two-stage least squares as well two-step feasible GMM estimation).

This is good and bad news at the same time: on one hand side, it means there is no evidence suggesting that simultaneity bias is a relevant problem in the above regressions, raising confidence in the estimates presented.[67] At the same time, however, it also rules out the only available candidates for a valid instrumentation strategy for dealing with other possible endogeneity problems in the data.

Given this situation, the remaining sections of this analysis present feasible (second-best) approaches to deal with possible endogeneity caused by measurement and reporting errors as well as non-random selection in the absence of valid instruments.

4.2 Measurement error

Another potential source of bias in the estimates reported above results from a possible systematic measurement error affecting the dependent variables. As briefly discussed in Section 2.2.1, using the share of households per constituency reporting infrastructure projects as a proxy for public infrastructure provision forcibly involves a significant amount of "double-counting", as households located in one area will report on the same roads or facilities constructed or improved in their neighbourhood. One would thus expect the share of households in a constituency reporting infrastructure projects to be larger in cases where households are located closer to each other (and thus to the same facilities).

Although including population density in the regression as well as restricting the sample to non-urban or rural constituencies only should control for this problem,[68] as an additional robustness

65 Information on reductions in distance to transport facilities is only available in the 2006 and 2010 surveys due to a change in LCMS reporting (see Section 2.2.1).

66 Overall, the OLS results suggest that electoral behaviour in Zambia is driven mainly by geographic location, urbanisation, ethnicity and poverty.

67 The implication is that, if it was the government's aim to provide infrastructure in order to win additional votes, this strategy would not seem to have been very effective. At the same time, the lack of evidence of reverse causality is fully compatible with the strategy underlying the core voter theorem, which does not aim at winning additional votes from swing voters but at retaining core supporters' loyalty and clientelistic support. Even the weakly significant positive coefficient on construction in the 2011 presidential elections can be interpreted in accordance with the core voter model: on average, in the 2011 elections the MMD lost votes when compared to the 2006 and 2008 elections, but arguably less so in constituencies that had benefited disproportionately from infrastructure construction in the period preceding the elections.

68 Note as well that given the fact that in the multi-party democracy period, the MMD enjoyed stronger support in (less densely populated) rural areas than in municipalities and cities, insufficiently controlling for the

check, I formulate a more restrictive measure for the dependent variable that can be expected to be largely insensitive to double-counting. For this I consider the smallest geographic units recorded in the LCMS, the standard enumeration areas, or SEAs (see Appendix B). In rural areas, a SEA typically covers 150–200 households or 2–4 villages (Jayne / Mason / van de Walle 2013, 17), which arguably should be roughly equivalent to the catchment area of a rural health or basic education facility.[69] To identify those SEAs where at least one construction project has taken place during a reporting period, I construct a binary variable that takes the value 1 if at least 10 per cent (to be conservative, but allowing for at least some noise in the reporting data) of households surveyed in a SEA report construction of a new road, health or education facility. I then run a probit regression on the same independent (constituency-level)[70] variables as before and on this dummy.

Table 8 reports average marginal effects for the 2006 and 2010 cross-sections. The positive and significant effects in both multi-party democracy periods for the full sample as well as for SEAs in rural districts only provide strong evidence that the results in the previous section are not a mere artefact of double-counting in more densely populated areas, but that political targeting of infrastructure does indeed occur in a form consistent with the core-voter model.

4.3 Reporting error

A further possible source of bias could be systematic reporting error in the data. Although overall reporting at the SEA level is fairly homogeneous, with an average polarisation[71] of .75 in 2006 and .77 in 2010 (equivalent to an average 1.9 and 1.8 households reporting in disagreement with the rest in a SEA with 15 households surveyed), there also is a substantial share of SEAs with relatively heterogeneous reporting on infrastructure provision. In both periods, in around 10 per cent of SEAs, at least one-third of the households reported in disagreement with the majority. Every fifth SEA has a polarisation index of 4.66 or lower (equivalent to 4 out of 15 households reporting in disagreement with the rest).[72]

multiple counting of facilities should, in principle, lead to underestimating rather than overestimating the extent of core-voter targeting.

69 One would thus typically expect there to be not more than one new facility of each type constructed in a SEA in one reporting period. In the case of roads, of course, there could be cases where more than one road is built, although in part this might be subject to interpretation. Anyhow, this is not relevant for this measure.

70 Because the LCMS is not arguably representative at the SEA level, it is not possible to calculate meaningful controls such as the poverty headcount at this level. Moreover, as not all SEAs are sampled in each round of the LCMS, the same is true for the controls for access to infrastructure prior to each reporting period. Therefore, these controls and language group shares are – as before – calculated at the respective constituency level. Population densities are for the district level.

71 Using a simple polarisation index calculated for each SEA$_i$ as
$\Pi_i = \left|\frac{no.\ of\ households\ reporting\ construction_i - no.\ of\ households\ reporting\ no\ construction_i}{no.\ of\ households_i}\right|$,
where a value of 1 (full polarisation) stands for unanimous reporting of either construction or no construction, and a value of 0 stands for an even split between households reporting construction and households reporting no construction.

72 In total, some 3,903 out of 18,628 households reported some kind of infrastructure construction in 2006 (840 roads, 1,929 health, 2,285 education); in 2010, 4,726 out of 19,363 reported some construction (1,447 roads, 1,909 health, 2,760 education).

Table 8: Infrastructure construction per SEA: 10% household share threshold

	2006		2010	
	all	rural	all	rural
votes MMD	.008***	.004*	.005***	.009***
	(.00)	(.00)	(.00)	(.00)
Municipal	–.077*		–.110**	
	(.04)		(.05)	
City	–.134		–.034	
	(.10)		(.09)	
access transport	.004	.001	–.012**	–.018***
	(.00)	(.00)	(.00)	(.01)
access health	–.010**	–.004	–.006	–.009
	(.00)	(.01)	(.01)	(.01)
access education	.011	.006	.004	.024
	(.01)	(.01)	(.01)	(.02)
poverty	–.002	–.001	.002	.003**
	(.00)	(.00)	(.00)	(.00)
sqrt pop	.000	.000	–.000*	–.001*
	(.00)	(.00)	(.00)	(.00)
pop density	–.000	–.010***	.000*	–.002
	(.00)	(.00)	(.00)	(.00)
Provinces				
Central	.290**	.008	–.010	–.021
	(.12)	(.15)	(.12)	(.17)
Copperbelt	.316**	.271*	.138	–.144
	(.13)	(.16)	(.13)	(.19)
Eastern	.296**	.345***	.357***	.573***
	(.12)	(.13)	(.14)	(.15)
Luapula	.158	.110	.254**	.337**
	(.13)	(.16)	(.12)	(.16)
Lusaka	.277*	.182	.273*	.477***
	(.15)	(.16)	(.16)	(.17)
Northern	.267***	.150	.226**	.270**
	(.10)	(.12)	(.10)	(.12)
North-Western	.084	.166	.054	.137
	(.12)	(.12)	(.12)	(.13)
Southern	.287**	–.030	.240*	.351*
	(.12)	(.16)	(.13)	(.18)
Language Groups (≥ 30 %)				
Bemba	–.264***	–.045	.163*	.353***
	(.08)	(.10)	(.09)	(.11)
Tonga	–.058	.265**	.180*	.336**
	(.10)	(.13)	(.11)	(.15)
North-Western	.044	–.026	.150	.222
	(.12)	(.13)	(.13)	(.14)
Nyanja	.161	.227*	–.085	–.129
	(.11)	(.12)	(.11)	(.12)
N	985	641	1000	610

Significance levels: * : 10% ** : 5% *** : 1%
Robust standard errors in parentheses

Of course, although this heterogeneity of responses could be an effect of households in less densely populated SEAs failing to report new facilities because they are located too far from them (although this should be largely controlled for by including population density as a regressor), there is also the possibility that individual household heads report incorrectly on infrastructure investments in their community. If such misreporting is not just random noise but linked to individual, household or constituency characteristics that, at the same time, can be expected to influence the voting behaviour in that constituency, then this too could distort the results reported above.

One can think of various reasons why this could be the case. For instance, if, due to cultural reasons, households belonging to particular ethnic groups attach higher value to education or have, on average, more children than households from other backgrounds, they might be better informed about education infrastructure and report infrastructure investments more accurately than others.

Similarly, as poorer households tend to be less mobile than richer ones, they can be expected to be less well-informed about projects undertaken in their area. Moreover, the LCMS questionnaire does not specify what area the survey question "*Have the following projects or changes occurred in your community in the last 12 months?*" (see Appendix B.1) refers to, as the term "community" does not correspond to any specific geographic or administrative area. Accordingly, households may have different interpretations of what counts as their "community", depending on constituency characteristics, such as ethnic homogeneity, but also on each household's individual characteristics, such as the means of transport at its disposal. This could mean that, as compared to richer households, poorer households systematically report on smaller geographic areas, and as a consequence for a given amount of infrastructure investment, in poorer constituencies fewer households would report infrastructure projects than would be the case in more affluent areas.

To address this possible problem, in addition to constituency controls, it is necessary to control for such individual and household characteristics, which may affect reporting accuracy. In order to do so, I run a probit regression of the probability that a household reports construction of infrastructure on the vote share received by the ruling MMD in the constituency where the household is located (and, as before, whether this constituency is an MMD "stronghold", where the ruling party received at least 40 per cent of the vote) and the same constituency-level controls as in the previous regressions – plus a number of household and individual characteristics that might be related to the household head's information on infrastructure in his/her community.

For household controls, I include the household's poverty status, size and quality of housing.[73] I also include a binary variable that takes the value 1 if somebody in the household has been sick during the past two weeks prior to the interview being conducted or has been continuously ill for the past 12 months, assuming that a case of sickness in the family would be associated with better awareness of new health infrastructure in the area. Similarly, I include a binary variable that is 1 if there is at least one school-age child (between 5 and 15 years) living in the household, assuming that this would be positively correlated with a household's interest in and information about basic education infrastructure in its area. For controls at the individual level, I include the household head's age, sex, marital status and educational background (years of schooling capped at 13 for degrees higher than "A" level).

Table 9 gives the average marginal effects of the probit regressions for the combined (roads, health, education) construction measure in the 2006 and 2010 LCMS cross-sections.[74]

73 The LCMS categorises dwellings into seven strata: rural "small scale" (the reference group), "medium scale", "large scale" and "non-agricultural"; and urban "low cost", "medium cost" and "high cost". Note that these categories are independent from a district's classification as being rural, urban and municipal, that is, there are households classified as "urban" in rural districts and vice versa.

74 The regressions were run with province dummies and constituency language shares, which are not shown in Table 9.

The results show that, even after controlling for household and individual characteristics, both the MMD vote shares as well as 40 per cent stronghold dummies are positively and significantly related to a household's probability to report at least one construction project, with the exception of the 2006 cross-section with only rural constituencies (columns 3 and 4), where both are insignificant.

Table 9: Probit average marginal effects presidential vote share and 40% strongholds

	2006				2010			
	all		rural		all		rural	
votes MMD	.003*		–.000		.004***		.006***	
	(.00)		(.00)		(.00)		(.00)	
40% MMD		.084**		.020		.086***		.116**
		(.04)		(.04)		(.03)		(.05)
Constituency Controls								
municipal	–.042	–.056			–.089***	–.100***		
	(.04)	(.04)			(.03)	(.04)		
city	–.110**	–.106**			–.008	–.031		
	(.05)	(.05)			(.06)	(.06)		
access transport	.001	.001	–.000	–.000	–.006*	–.005	–.007	–.005
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
access health	–.004	–.004	–.002	–.001	–.003	–.004	–.000	–.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)	(.01)
access education	.012**	.012*	.012**	.012**	.009	.010	.008	.006
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
poverty	.001	.001	.002	.002	.002*	.002**	.002	.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	.000	.000	.000	.000	–.000	–.000	–.000	.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop density	.000	.000	–.002**	–.002**	.000	.000	–.003	–.003*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls								
poor	–.035***	–.034***	–.046***	–.046***	.012	.012	.032	.028
	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
hh size	.002	.002	.004	.004	.003**	.003**	.005**	.005**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
medium scale	.048**	.045**	.049**	.048**	.009	.012	.016	.018
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.03)
large scale	.128	.135	.199**	.198**	.026	.031	.015	–.005
	(.09)	(.09)	(.08)	(.08)	(.07)	(.07)	(.11)	(.12)
non-agric	–.006	–.007	–.001	–.001	.008	.010	.018	.018
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)
low cost	.103***	.103***	.103***	.103***	.140***	.132***	.198***	.183***
	(.03)	(.03)	(.03)	(.03)	(.03)	(.03)	(.04)	(.04)
medium cost	.018	.016	.011	.011	.085**	.081**	.141**	.138**
	(.04)	(.04)	(.05)	(.05)	(.04)	(.04)	(.06)	(.06)
high cost	.021	.021	.095*	.095*	.130***	.117**	.363***	.321***
	(.03)	(.03)	(.06)	(.06)	(.05)	(.05)	(.08)	(.07)
someone ill 2 wks	.030***	.030***	.032**	.032**	.031***	.033***	.031**	.032**
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
someone ill yr	.013	.013	.006	.007	.027**	.030**	.021	.023
	(.01)	(.01)	(.02)	(.02)	(.01)	(.01)	(.02)	(.02)
schoolage childr	.009	.010	.021*	.021*	–.003	–.003	–.002	–.002
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Individual Controls								
married	.002	.001	–.014	–.015	–.025***	–.025***	–.039**	–.040**
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)
female	–.004	–.005	.002	.001	–.045***	–.044***	–.064***	–.067***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)
age	–.000	–.000	.000	.000	–.000	–.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	–.004**	–.004**	–.001	–.001	–.001	–.001	–.001	–.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
N	16397	16397	9393	9393	17327	17327	9415	9415

Significance levels: $*$: 10% $**$: 5% $***$: 1% Clustered standard errors in parentheses

Province dummies and constituency language shares included but not reported

The effect is largest for rural constituencies in 2010: on average, a one-unit increase in the MMD's vote share increases a household's predicted probability to report some infrastructure construction by .0057. With all covariates set at their mean, a marginal increase in the MMD vote (mean=50.077) increases the predicted probability to report construction by .0061. Being located in a 40 per cent government stronghold increases a household's predicted probability to report construction of infrastructure on average by .116.[75] Holding all other covariates at their means, being located in a stronghold increases the predicted probability to report construction by .119, from .224 to .343.

Figure 7 shows the estimated marginal probability effect of the MMD vote share at this point in the distribution estimated for the probit reported in Table 9 as well as in an ordered probit specification, with the number of construction projects reported by households as the dependent variable.[76]

Estimated individually by sector (in a probit model), the 40 per cent stronghold dummy becomes significant for health and education facility construction in 2006 in the full sample, but remains insignificant in the rural sub-sample. In 2010 the stronghold dummy is positive and significant in all three sectors, the vote share only in roads (1 per cent level) and education (5 per cent level) in the full sample. In the rural sub-sample, the vote share is only significant in roads and education, the stronghold dummy only in health (results reported in Tables D.35–D.38 in Appendix D).

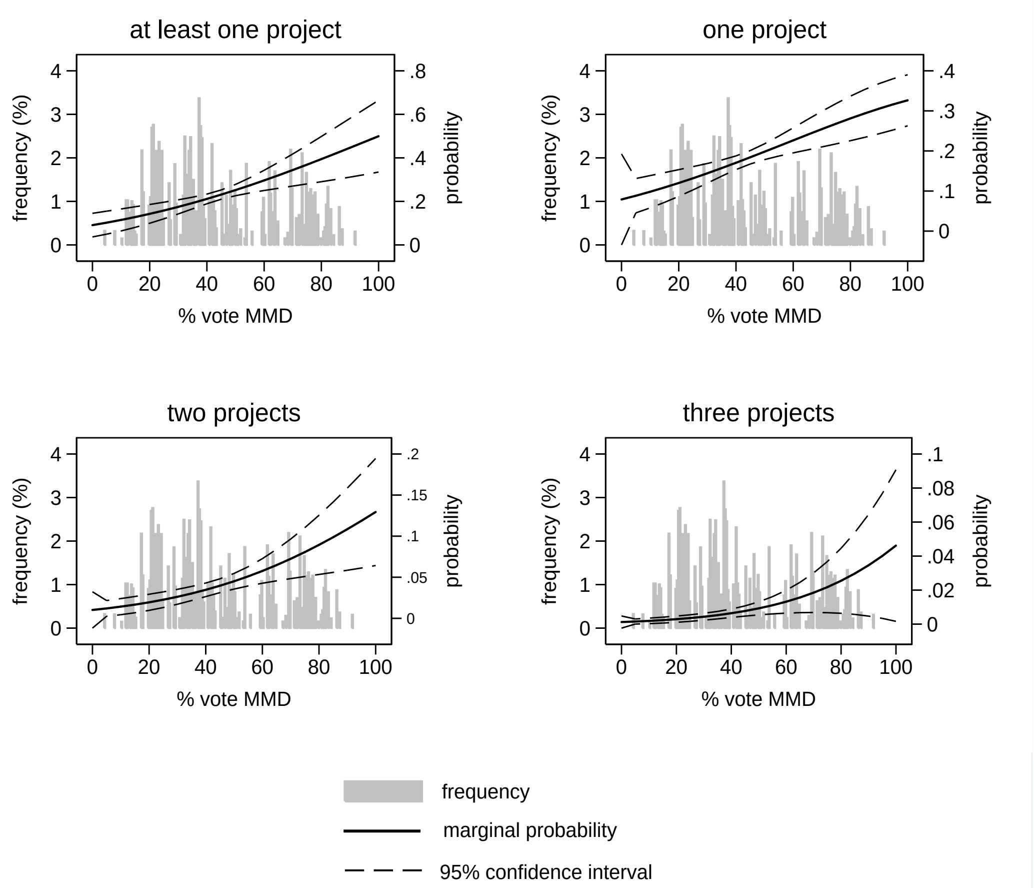
Besides the main explanatory variables, a number of the included household and individual controls (housing quality, health status of household members, marital status and gender of the household head) are statistically significant, and thus explain some of the probability to report infrastructure investment.[77] Including them in the regression should thus control for at least some portion of the suspected reporting error. Notably, not all controls are significant, and those that are significant do not explain the full extent of reporting heterogeneity. Moreover, the estimates for household and individual characteristics are not very consistent across the two time periods (except for housing quality in the urban low- and high-cost stratum and a household member having been sick during the two weeks prior to the survey interview). However, this need not be a problem for the reported estimates, as long as any remaining reporting errors are random and not systematically linked to voting behaviour and/or infrastructure investment decisions by the government.

75 This is the "average treatment effect" of being located in a government stronghold.

76 Means of categorical variables such as province dummies or household strata are evidently not particularly meaningful by themselves. Estimating the effect at this arbitrary point merely serves to gauge the size of the effect of the vote share on households' probability to report infrastructure construction. Figure F.1 in Appendix F shows the same plots for the rural sub-sample.

77 In the full sample for 2010, with the cut-off set at a probability of .5, the model correctly predicts outcomes (i.e reporting infrastructure construction or not) for almost 76 per cent of the observations. Yet, it predicts only around 9 per cent of the "positive" outcomes correctly, versus 98 per cent of the negatives. However, when setting the cut-off at .25, the prediction correctly classifies 64 per cent of the positives and 65 per cent of the negatives. In the rural sub-sample, the model performs comparably well, correctly classifying 21 per cent of the positives and 94 per cent of the negatives (total 71 per cent) with the cut-off at .5; and 77 per cent of the positives and 46 per cent (total 56 per cent) of the negatives with the cut-off at .25. For the 2006 cross-section, a .25 cut-off correctly predicts 45 per cent of the positives and 76 per cent of the negatives (total 70 per cent) in the full sample, and 48 per cent of the positives versus 71 per cent of the negatives (66 per cent total) in the rural sub-sample.

Figure 7: Marginal probability of households reporting construction in 2010 (at sample means)



Source: Author

4.4 Omitted variables and selection bias

Another potentially important problem has to do with observed and unobserved factors that determine whether a constituency votes predominantly for the ruling MMD or not. As discussed above, there is a chance that the presented estimates might suffer from an omitted variable bias, if there are unobserved characteristics of constituencies that are correlated with both voting behaviour and infrastructure provision, although the large number of constituency controls included makes it difficult to imagine what those factors might be.[78] With the available data, neither the panel fixed effects nor the instrumental variable approach presented above appear to be applicable to adequately control for this possible problem until additional rounds of the LCMS become available or appropriate instruments are found.

Yet, for the threshold regressions presented in Tables 6 and 9, there is also the possibility that observable characteristics may cause bias in the estimates, which the constituency-level tobit and household-level probit regressions can only insufficiently address. This is because

78 Moreover, the random effects models are not rejected by the applied statistical tests, providing no evidence in this direction.

"stronghold" and "non-stronghold" constituencies in the sample differ systematically with regard to some of the control characteristics.

A useful way to think about this problem is as a "treatment with non-random selection" situation, where the "treatment" for a constituency consists in being (considered) a government stronghold. Evidently, this "treatment" is not random but correlated to observable (and possibly unobservable) constituency characteristics. For instance, it is perceivable that the government is indeed interested in reducing poverty and directs it social infrastructure at constituencies with a higher poverty headcount. If for some reason (that is unrelated to infrastructure provision) the poor tend to vote for the MMD or if, for instance, those ethnic groups loyal to the ruling party tend to live in poorer regions, then the regression approach taken above cannot adequately distinguish between this poverty effect and the political-support effect.

To address at least the "selection on observables" share of this possible bias, I apply an entropy balancing technique proposed by Hainmueller (2012) to achieve covariate balance between households in MMD strongholds and non-strongholds with regard to constituency characteristics that – in view of the above regression results and plausibility considerations – can be expected to affect both voting behaviour and government investment decisions: the constituency poverty headcount, constituency population, remoteness (proxied by the distance to the national capital), and the share of households belonging to one of the four major language groups (Bemba, Tonga, North-Western and Nyanja). In a second step, I then regress the probability that an individual household reports the construction in its area of either a road, health or education facility, or any of these three, on the 40 per cent MMD vote share dummy and the same controls at the individual, household and constituency levels as before, with observations from the non-stronghold "control group" weighed in accordance with the entropy balancing outcome.

Table 10 shows the first three moments of the sample distributions of the constituency covariates before and after the rebalancing for the 2006 cross-section in the rural sub-sample. Especially for the language group shares, but also population and remoteness, the figures in the upper half of Table 10 show quite substantial imbalance between the "treatment group" of 40 per cent stronghold constituencies and the "control group" of non-strongholds. A considerable share of this imbalance is removed in the re-weighted sub-sample shown in the lower half of Table 10.

Tellingly, for the 2010 reporting period, applying the same balancing procedure does not converge within any reasonable tolerance levels, evidently because "treatment" and "control" constituencies differ too dramatically with respect to some of the covariates, in particular with respect to language group shares. This indicates that the described selection bias could indeed be relevant for the estimates reported in Tables 6 and 9.

As a second-best alternative, I replace language group shares with the 30 per cent language group dummies used in the constituency-level regressions above and run the re-balancing routine over these and the remaining constituency covariates. Table 11 shows the result of this entropy-based weighting for the 2010 sample (the 30 per cent North-Western language group dummy is dropped because of collinearity). Evidently, the covariate balancing is much less efficient in the 2010 cross-section than for 2006 and, as a consequence, a much smaller portion of the possible selection bias will be removed from the estimates.

Table 10: Entropy balancing, 2006 reporting period (rural constituencies)

	40% Strongholds			Non-Strongholds		
	36 constituencies 4094 households			64 constituencies 6919 households		
	Before Entropy Balancing					
	mean	variance	skewness	mean	variance	skewness
poverty headcount	79.64	99.39	-.1242	80.43	107	-.344
population (1000)	58.42	765.6	.6328	64.84	1045	1.036
km Lusaka	719.9	89061	-.3093	488.7	76458	.05485
% Bemba	71.86	1471	-1.022	13.39	766.7	2.435
% Tonga	4.549	164.6	3.519	25.48	1317	.9679
% North-Western	10.92	759.7	2.542	12.24	754.1	2.44
% Nyanja	1.132	4.152	3.163	25.1	1342	1.234
	After Entropy Balancing					
	mean	variance	skewness	mean	variance	skewness
poverty headcount	79.64	99.39	-.1242	79.64	99.4	-.1239
population (1000)	58.42	765.6	.6328	58.42	765.9	.6334
km Lusaka	719.9	89061	-.3093	719.8	30062	-1.776
% Bemba	71.86	1471	-1.022	71.85	1564	-1.204
% Tonga	4.549	164.6	3.519	4.556	335	4.141
% North-Western	10.92	759.7	2.542	10.92	788.8	2.498
% Nyanja	1.132	4.152	3.163	1.136	6.098	12.19

Table 11: Entropy balancing, 2010 reporting period (rural constituencies)

	40% Strongholds			Non-Strongholds		
	62 constituencies 6795 households			36 constituencies 3942 households		
	Before Entropy Balancing					
	mean	variance	skewness	mean	variance	skewness
poverty headcount	70.89	179.6	-.6608	67.81	358.7	-1.214
population (1000)	83.14	1958	1.328	75.12	1100	.1008
km Lusaka	543.4	95700	.07152	577.5	94201	.03451
30% Bemba	24.87	1869	1.163	47.72	2495	.09142
30% Tonga	10.23	918.3	2.625	41.35	2426	.3513
30% Nyanja	22.15	1725	1.341	9.031	821.7	2.859
	After Entropy Balancing					
	mean	variance	skewness	mean	variance	skewness
poverty headcount	70.89	179.6	-.6608	68.96	390.3	-1.515
population (1000)	83.14	1958	1.328	79.81	541.9	.399
km Lusaka	543.4	95700	.07152	563.2	81039	-.7961
30% Bemba	24.87	1869	1.163	31.46	2157	.7986
30% Tonga	10.23	918.3	2.625	13.35	1157	2.155
30% Nyanja	22.15	1725	1.341	19.54	1573	1.537

Note: 30% North-Western dropped because of collinearity

Table 12 shows the average marginal probability (or average "treatment") effects estimated through this two-step approach for presidential strongholds in rural constituencies in both cross-sections. The covariate balancing clearly affects the estimates quite substantially. The estimated average marginal probability effect of being located in a (rural) 40 per cent MMD stronghold in 2006 reporting any infrastructure construction is now significant at the 1 per cent level in both periods and of roughly similar magnitude: in 2006, living in a government stronghold constituency increases a household's probability to report any type of construction by an average .108 (up from a statistically insignificant .020 in the unbalanced rural sub-sample reported in column 4 of Table 9). In 2010 (for which arguably a smaller portion of possible bias is removed through the balancing procedure) the average marginal effect on the 40 per cent vote dummy increases slightly to .125 (column 8) compared to the estimate of .116 in Table 9.

The estimated marginal probability effect of the stronghold dummy, when all other predictors are set at their means (not shown in Table 12), is now also of very similar magnitude in both periods, increasing a household's probability to report any construction by some 11 percentage points, almost doubling it from .112 in non-strongholds to .221 in strongholds in 2006; and by some 13 percentage points, from .174 to .307, in 2010.

Differing from the findings above, the estimates for construction in each of the three sectors suggest that this positive effect on aggregate construction in both periods is driven by infrastructure provision in health and education, with no significant results for roads.

Together, these results suggest that the previous estimates of the effect of the MMD stronghold dummy on infrastructure construction might indeed suffer from selection bias. Although arguably only a portion of this bias is removed by the applied entropy balancing procedure, the findings seem to indicate that the previous estimates may be biased downwards rather than upwards.

Running a final robustness check by calculating the average treatment effect (ATE) of being located in a 40 per cent government stronghold on a household's probability to report any type of construction, using Mahalanobis nearest neighbour matching based on the same covariates used for the entropy balancing in Table 10,[79] seems to confirm this for 2006, yielding a somewhat smaller, but highly significant estimated ATE of .061 (robust standard error: .012). For 2010, the estimated ATE is also significant at the 1 per cent level and, at .112 (robust standard error: .012), of similar magnitude as the "baseline" in the last column of Table 9 (.118).[80]

For the same reasons as before, nearest neighbour matching will only remove some of the suspected bias in the estimates.[81] This notwithstanding, the results further corroborate the evidence in support of the core-voter theorem applying to infrastructure construction in Zambia, at least in the sectors of health and basic education.

79 Propensity score matching is not feasible, as the balancing property is not satisfied in either cross-section for the covariates used.

80 The respective estimated average treatment effect on the treated (ATT) is .091 (standard error: .016) for 2006, and .145 (standard error: .014) for 2010.

81 Note that for 2010 the covariates used for the nearest neighbour matching are not the same as those used for the entropy balancing.

Table 12: Probit average marginal effects for presidential 40% strongholds after entropy balancing (construction, rural constituencies)

	2006				2010			
	Roads	Health	Educ.	Any	Roads	Health	Educ.	Any
40% MMD	–.003	.088***	.110***	.108***	.029	.126***	.071*	.125***
	(.02)	(.03)	(.02)	(.03)	(.02)	(.03)	(.04)	(.04)
Constituency Controls								
access transport	–.000			–.002	–.002			–.008*
	(.00)			(.00)	(.00)			(.00)
access health		.004*		.004		–.006		–.001
		(.00)		(.00)		(.00)		(.01)
access education			.008	.015*			.004	.008
			(.01)	(.01)			(.01)	(.01)
poverty	.002*	.003***	.001	.004**	–.000	.001	.001	.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	–.000	.001***	–.000	.000	.000*	–.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop density	.001	–.003	–.002	–.004	–.001	.001	–.002*	–.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls								
poor	–.017***	–.008	–.002	–.035**	.025***	.018	.068***	.082***
	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)	(.02)	(.03)
hh size	.002*	.003*	.005*	.010***	.001	.002**	.008	.007
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)	(.01)
medium scale	.005	–.007	.002	–.015	–.016	–.005	–.050	–.061
	(.01)	(.01)	(.02)	(.03)	(.02)	(.01)	(.03)	(.05)
large scale	–.018***	–.013	–.000	.019	.031	.023	–.038	–.004
	(.01)	(.05)	(.08)	(.10)	(.05)	(.05)	(.06)	(.10)
non-agric	–.008**	–.012	.018	–.018	–.022	.010	.011	.007
	(.00)	(.01)	(.01)	(.02)	(.02)	(.01)	(.02)	(.03)
low cost	.101**	.065**	.040	.149**	.022	.108***	.174***	.174***
	(.04)	(.03)	(.04)	(.07)	(.02)	(.03)	(.04)	(.04)
medium cost	.027	.011	.006	.005	.000	.076**	.117**	.081
	(.02)	(.04)	(.03)	(.05)	(.02)	(.04)	(.05)	(.06)
high cost	.067*	.148*	.048	.127	.077	.178**	.240***	.291**
	(.04)	(.09)	(.09)	(.09)	(.06)	(.08)	(.09)	(.11)
someone ill 2 wks		.023**		.043**		.004		–.008
		(.01)		(.02)		(.01)		(.02)
someone ill yr		.030**		.001		–.003		.029
		(.01)		(.02)		(.01)		(.02)
schoolage childr			.010	–.021			–.026	–.007
			(.02)	(.02)			(.02)	(.01)
Individual Controls Household Head								
married	–.021	–.066**	–.004	–.052**	–.045	.001	–.022*	–.055
	(.01)	(.03)	(.03)	(.03)	(.03)	(.01)	(.01)	(.04)
female	–.019	–.045***	–.032	–.064**	–.035*	–.012	–.044***	–.082***
	(.01)	(.02)	(.02)	(.03)	(.02)	(.01)	(.01)	(.02)
age	.000**	–.001	.000	–.000	–.000	–.000	–.001	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	.002**	.003	.002	.005	.004***	.000	–.007	–.004
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)	(.01)
N	9393	9393	9393	9393	9456	9415	9456	9415

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Province dummies and language shares included but not reported

5 Conclusions

The main methodological interest of this paper is to demonstrate the usability of household-level data to study political economy features of public finances in developing countries that commonly escape empirical scrutiny because of poor data availability. The immediate empirical interest is in testing whether there is evidence of political targeting of public infrastructure provision in a "typical" sub-Saharan developing country; and whether this targeting is in line with either of two competing theoretical models of how public expenditure in developing countries is geographically distributed in reaction to the population's voting behaviour: the swing-voter versus the core-voter model.

There is a good amount of theoretical literature on the type of "neopatrimonial" governance systems found in many sub-Saharan African countries, and for which Zambia is often cited as a showcase example. Part of this literature predicts that – different from more advanced democracies where the swing-voter model appears to prevail – in neopatrimonial regimes, the core voter model should generally be observed. Rigorous empirical evidence on this, however, is scarce, as reliable data on public spending is often unavailable.

Using information from Zambia's Living Conditions Monitoring Surveys (LCMSs) as an alternative data source, I find strong and robust evidence for political targeting of infrastructure provision, in line with the core-voter model in Zambia, in particular in the "social" sectors of health and basic education. The findings suggest that, during the first decade of the millennium, health and basic education infrastructure was targeted disproportionately to constituencies that supported the ruling party in presidential and parliamentary elections. The evidence further suggests that this affected primarily the construction of new infrastructure, whereas for improvement and rehabilitation of existing facilities, there is no strong evidence of political targeting. This is in line with the argument that governments may enjoy a much larger degree of freedom in allocating new infrastructure than in improving or rehabilitating existing facilities, as well as presumably higher "visibility" and political gain. It is also consistent with the findings that the targeting seems to have been mostly concentrated in rural constituencies rather than in urban areas, where presumably the density of pre-existing facilities is much higher. For the roads sector, the evidence is slightly less conclusive: although the estimates, in principle, show the same pattern as in health and education, they are not as robust to modifications in the econometric specification.

Indications are that this political targeting came about only with the introduction of multi-party democracy in Zambia at the turn of the millennium, although the specific allocation patterns under effective one-party rule prior to 2001 would require more extensive analysis to substantiate this claim. However, the evidence does suggest that allocation decisions are primarily based on presidential rather than parliamentary election results, which is consistent with the notion that political power in neopatrimonial regimes is strongly concentrated in the presidency.

The results are robust to controlling for population density, poverty levels, ethnic composition and other regional disparities as well as across various specifications aimed at controlling for reverse causality, measurement and reporting errors, as well as selection on observables.

The effects found for the 2006 and 2010 periods are arguably also fairly substantive: the estimates suggest that a 1 percentage point increase in the ruling party's vote share in presidential elections increases the share of households in a constituency that report some infrastructure construction by more than .4 percentage points. Being located in a government stronghold increases a rural household's predicted probability to report some infrastructure construction by up to 13 percentage points, depending on the period and model specification.

However, given the fact that, whereas the estimates for random effects models and individual cross-sections are highly significant and the fixed effects estimates are mostly insignificant, it cannot be ruled out that the results might be partly driven by some unobserved characteristics of constituencies that are systematically linked to both voting behaviour and infrastructure provision. With only two survey rounds from the multi-party democracy period available for Zambia, for the time being the possibilities to control for such an omitted variable bias are limited and will only become available with the publication of additional rounds of the LCMS or the identification of valid instruments for voting behaviour.

This notwithstanding, this paper provides a "proof of concept" for the usability of household survey data for studies of the political economy of public finances in developing countries. The kinds of data used in this paper are widely available from similar Living Standards Measurement Studies (LSMSs) conducted in numerous developing countries. The proposed approach thus readily lends itself to replication in a number of countries with similar political and administrative structures as those in Zambia.

For aid donors concerned about fiduciary risks when providing development assistance through recipient countries' own public financial management (PFM) systems, the findings imply two things. For one, donor agencies concerned about the allocative efficiency and poverty orientation of public expenditure in aid-recipient countries need to not only look at aggregate sector allocations to assess the poverty orientation of the government's budget, but should also consider analysing intra-sectoral distributional patterns of public spending. With widely available household survey data, they have a valuable source of information at hand to do so. Secondly, the findings of this paper further add to the mounting evidence that, in order to foster good expenditure management and allocative and operational efficiency in developing countries, purely technical support for PFM reforms is not enough. Donors also need to develop a much deeper understanding of the political economy that drives spending decisions in their partner countries.

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Appendix

A Zambia – a showcase of neopatrimonialism

It is a common perception that many present-day African states share similar features such as patrimonial and charismatic forms of rule that continue to exist behind a facade of a (mostly weakly) functioning administrative state (Tetzlaff / Jakobeit 2005, 135). These features, it is argued, have led to the emergence of – in many ways similar – "hybrid regimes" (Diamond 2002) shaped by competing formal and informal institutions. Various authors argue that Zambia is a typical case of this "hybridisation" (e.g. Erdmann / Simutanyi 2003).

A.1 Recent political history of Zambia

After Zambia gained independence from British colonial rule in 1964, the country experienced a relatively short period of multi-party democratic rule (commonly referred to as the "First Republic") and was celebrated as a model for peaceful democratic change on the African continent (Bratton 1992, 81). The First Republic's president, Kenneth Kaunda, in his first years in office, formulated a socialist and anti-colonial ideology to forge a national identity under the slogan "One Zambia – One Nation", aimed at overcoming tribal fragmentation and building a broad power base (Burnell 2001, 245). When it became clear in 1972, however, that this policy had failed, Kaunda proclaimed a one-party state and banned all political parties apart from his United National Independence Party (UNIP). This step was facilitated by the fact that, even though the First Republic had been formally based on a Westminster-style parliamentary system, the constitution granted the president extensive executive powers, with few provisions for effective parliamentary or juridical control.

This "Second Republic", officially coined a "one-party competitive system", has been described as a "mild dictatorship" or a "weakly authoritarian state" (Erdmann / Simutanyi 2003, 4). Although formally a one-party-state, the political system during this period was marked by the president's personalised style of decision-making and cronyism, as the executive power was concentrated in the Office of the President rather than in the party's Central Committee.

It was only in 1990 when leaders of the Zambia Congress of Trade Unions (ZCTU) and former UNIP members founded the Movement for Multi-Party Democracy (MMD), that President Kaunda was pushed to accept a number of democratic changes, including the reintroduction of multi-party parliamentary and presidential elections in 1991, in which the MMD secured nearly 75 per cent of the votes and Frederick Chiluba was elected president of what was to become the "Third Republic".

Chiluba soon began to re-centralise political power and to build his own dominant one-party system based on the MMD, with any emerging democratic structures being heavily constrained by a lack of checks and balances as well as centralist patronage structures, which allowed him to secure a second term in office in 1996 without a serious challenge at the polls (see Table A.1), helped by UNIP's electoral boycott (Lindemann 2011, 1854). Thus, also the "Third Republic" continued to be shaped by authoritarian tendencies and neopatrimonial practices (Erdmann / Simutanyi 2003, 76).

Democratisation only gained new momentum in 2001, when Chiluba's bid to secure a third consecutive presidential term failed and his party fellow Levy Patrick Mwanawasa became the MMD presidential candidate.[82] After winning the 2001 presidential elections by a narrow margin (see Table A.1) and amidst allegations of widespread irregularities, lost ballot boxes and political intimidation (Erdmann 2007, 487), Mwanawasa comfortably won the 2006 elections, which this time were considered as being broadly free and fair.[83]

Table A.1: Presidential election results 1996–2011, % votes

Party candidate	1996	2001	2006	2008	2011
MMD	68.96	28.69	42.98	40.09	35.63
PF	-	3.35	29.37	38.13	42.24
UPND	-	26.76	-	19.70	18.28
FDD	-	12.96	-	-	0.25
UNIP	-	9.96	-	-	0.36
HP	-	7.96	1.57	-	-
AZ	4.47	0.56	-	-	-
ZDC	12.11	-	-	-	-
NP	6.33	-	-	-	-
MPD	3.13	-	-	-	-
ZRP	-	4.84	-	-	-
NCC	-	2.20	-	-	-
SDP	-	0.58	-	-	-
NLD	-	0.54	-	-	-
UDA	-	-	25.32	-	-
APC	-	-	0.76	-	-
HERITAGE	-	-	-	0.76	-
ADD	-	-	-	-	0.95
NAREP	-	-	-	-	0.38
NMP	-	-	-	-	0.23
ZED	-	-	-	-	0.08
%-point lead MMD	56.85	1.93	13.61	1.96	-6.61

Data source: Electoral Commission of Zambia

After Mwanawasa's sudden death, "emergency" presidential elections had to be held in 2008, which Mwanawasa's vice president, Rupiah Banda, won by a narrow margin over the PF's candidate, Sata.[84] In September 2011, Banda lost the presidential elections to the opposition PF's candidate, Sata,[85] ending 20 years of MMD rule in what was deemed transparent and credible elections (EU-EOM, 2011, 3). Sata has since been accused of of establishing an increasingly autocratic regime, silencing opposition media and politicians, and filling high-level government positions with relatives and cronies. In sum, Zambia, at the beginning of the millennium, is commonly considered an electoral democracy in which important neopatrimonial features persist, such as limited political transparency and widespread political corruption, which constrain democratic voice and accountability (Faust 2009).

82 In 2007, former President Chiluba was formally charged with embezzlement of US$ 500,000 of public funds for private purposes, but allegations against him were lifted in August 2009 (Transparency International 2008, 154–155).

83 Mwanawasa secured 42.98 per cent of the vote versus 29.37 per cent for the Patriotic Front's (PF) candidate, Michael Sata, and 25.32 per cent for Hakainde Hichilema, who that year ran for the United Democratic Alliance (UDA), an outfit joining the forces of the United Party for National Development (UPND), the Forum for Democracy and Development (FDD) and the United National Independence Party (UNIP) (ECZ 2006).

84 Banda won 40.09 per cent of the votes, compared to 38.13 per cent for Sata and 19.7 per cent for Hichilema (ECZ 2008).

85 Sata won with 42.24 per cent of the votes over Banda, with 35.63 per cent, and Hichilema, with 18.28 per cent (ECZ 2011).

A.2 Fiscal centralism in Zambia

One characteristic feature of neopatrimonial systems is a lack of effective vertical separation of powers that would impose limits on the extent to which elites in central government positions can use public resources to maintain clientelistic networks and to mobilise political support at the local level. Therefore, the degree of political, administrative and fiscal decentralisation is a key factor for the scope of neopatrimonial practices in a state.

Zambia is a latecomer with regard to decentralisation reforms, and particularly fiscal decentralisation remains very weak in Zambia. Administratively, the country is divided into nine provinces (Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern and Western). These provinces are further divided into 72 districts, which in turn are divided into 150 constituencies and 1,207 wards. However, these sub-national entities have very little spending autonomy. The province level is a purely administrative tier without any legislative body or autonomous powers when it comes to budget allocation decisions. At the district level, local councils are elected by popular vote. However, the political autonomy of councils remains weak, as mayors have only representative functions. Sector policies are carried out almost exclusively by central sector ministries' de-concentrated structures in the districts. These are coordinated by district commissioners nominated by the President's Office.

Plans to establish a transparent and rules-based integrated fiscal-transfer system have been stalled to date, in particular as the cabinet has repeatedly refused to adopt the Decentralization Implementation Plan (DIP), developed in 2006 to put decentralisation policy into practice. The DIP was finally approved in December 2009; in the 2010 budget, for the first time, an allocation formula for a number of transfer mechanisms to the district level was introduced. However, the amount of transfers remained minimal (see Leiderer et al. 2012, 101). In addition, local sources of public revenue have been gradually withdrawn since the 1970s, and the possibilities of income generation at the local level are considered to be very low and inadequate to deliver the mandated services (MoFNP / MoLGH / Zambian-German Development Cooperation (2008, 11f.).

As a result of this policy, the share of local government spending in total public expenditure in Zambia is almost negligible. Concrete and reliable data on the amount of transfers reaching the individual municipalities is scarce; yet estimates show that transfers to local government entities amounted to less than 3 per cent of central government spending by the middle of the past decade. These transfers are almost entirely used for the administrative costs of local councils and very little money is available for capital expenditures such as investment in local infrastructure.[86] In consequence, local governments in Zambia depend almost entirely on the central government to improve the economic infrastructure and living conditions in their area. This set-up, of course, is in line with the general logic of a neopatrimonial state, in which power and resources remain highly concentrated at the central level and are prone to be dispensed with at the discretion of the ruling elite, possibly in return for political loyalty (Bratton / van de Walle 1994; van de Walle 2001; von Soest 2007).

86 An exception to this is the Constituency Development Fund (CDF), through which resources in the form of a fixed block grant are transferred to each constituency. The CDF was introduced in 2006 and, since its inception, Parliament has continuously increased the amount received by each MP for his/her constituency, from an initial 60,000,000 Kwacha to 600,000,000 Kwacha (roughly EUR 90,000) in 2009.

B Data sources

B.1 The Zambia Living Conditions Monitoring Survey

Similar to numerous other African countries, Zambia in the 1990s began to carry out regular large-scale Living Conditions Monitoring Surveys (LCMSs) based on the World Bank's LSMS[87] methodology aimed at monitoring the impact of government and donor policies and programmes.

To date, six LCMSs have been conducted by the Central Statistical Office of Zambia (1996, 1998, 2002/3, 2004, 2006, 2010). These nation-wide surveys are carried out in all of Zambia's 72 districts on a cross-sectional[88] sample basis with the main objectives to:

(i) monitor the effects of government policies on households and individuals;

(ii) measure and monitor poverty overtime in order for government to evaluate its poverty-reduction programmes;

(iii) monitor the living conditions of households in Zambia in the form of access to various economic and social facilities and infrastructure and access to basis needs; food, shelter, clean water and sanitation, education and health, etc.;

(iv) identify vulnerable groups in society.[89]

The LCMS is designed to collect data for every district in Zambia based on a sample of 1,000 Standard Enumeration Areas (SEAs), covering approximately 20,000 households. In the available data sets, the 1996 LCMS covers 610 SEAs, the 1998 LCMS 818, the 2006 LCMS 985, and the 2010 LCMS 1,000. A SEA normally includes 150–200 households, or about 2–4 villages (Jayne / Mason / van de Walle 2013, 17). According to the 1998 LCMS enumerator's instruction manual (Republic of Zambia 1998a, 7), 25 households should be sampled in each urban SEA and at least 15 from each rural SEA, with more households to be enumerated in rural SEAs if there are large-scale farmers (to be fully covered), or if households are in the presence of so-called micro-projects, in which case 30 households are to be surveyed (Republic of Zambia 1998b, 15). In practice, the available data sets cover between 9 and 26 households per SEA in 1996, between 3 and 45 households per SEA in 1998, between 13 and 40 households per SEA in 2006 and between 13 and 29 households in the 2010 survey data (Republic of Zambia 1998a, 7).

In its latest available version (2010), the LCMS questionnaire covers the following areas: Demography and Migration; Orphanhood; Health; Education; Economic Activities; Income; Household Expenditure; Household Assets; Household Amenities and Housing Conditions; Household Access to Facilities; Self-assessed Poverty and Household Coping Strategies; Household Agricultural Production. In addition to individual and household-level data, the LCMS records information on each included enumeration area and constituency, e.g. whether they are located in a rural, municipal or city district. For the purposes of this paper, the following variables are extracted from the LCMS:

87 Living Standards Measurement Studies.

88 Only the 2002/3 survey was conducted as a longitudinal survey to collect data over a period of 12 months.

89 Republic of Zambia (1999, 2).

Poverty The LCMS records household expenditure on various items, including a basic-needs basket that defines the poverty line. By establishing the share of households (weighted by household size) whose monthly expenditure is below the price indicator for this basket, measures for poverty incidence (poverty headcount) as well as for poverty severity and the poverty gap are calculated. Table B.1 shows the poverty headcount and population numbers (rounded to the nearest 1000) for the nine provinces of Zambia in 1996, 1998 and 2006.[90]

Table B.1: Poverty incidence by province

	Percentage Poor			Population		
Province	1996	1998	2006	1996	1998	2006
Central	84	77	67	940,000	1,016,000	1,222,000
Copperbelt	65	65	34	1,633,000	1,824,000	1,782,000
Eastern	85	80	74	1,204,000	1,296,000	1,611,000
Luapula	87	81	73	646,000	698,000	933,000
Lusaka	58	52	22	1,370,000	1,527,000	1,640,000
Northern	87	81	74	1,042,000	1,226,000	1,489,000
North-Western	90	76	69	515,000	546,000	709,000
Southern	83	76	66	1,085,000	1,287,000	1,451,000
Western	88	89	84	693,000	748,000	885,000
Total	78	73	59	9,128,000	10,168,000	11,715,000

Source: LCMS 1996, 1998, 2006

Based on this information, the constituency poverty headcount as well as population figures per constituency are calculated.

Access to infrastructure The section "Household Access to Facilities" of the LCMS records (self-reported) distances in km to the nearest facility of different types of infrastructure for each household (independent of whether these facilities are actually used by household members). In the 1998 questionnaire, the list of facilities included the following:

- food market
- post office/postal agency
- primary school
- secondary school
- health facility (health post/centre/clinic/hospital)
- hammermill
- input market (for seeds, fertilizer, agricultural implements)
- police station/post
- bank
- public transport (road, rail, or water transport)

In subsequent years, changes to the questionnaire included adding public phones and internet cafes as well as introducing a distinction between different types of primary schools.

The general interest of this paper is in the targeting of publicly provided economic and social infrastructure. This arguably applies to post offices, police stations, health and education facilities. Post offices, police stations and secondary schools tend to be located in central locations, and thus arguably do not lend themselves to geographic targeting to the same extent as facilities serving smaller catchment areas, such as basic schools or health facilities. Moreover, basic

90 Note that the poverty line was changed between surveys (Republic of Zambia 2006, 112).

education and health care are commonly understood to be of particular importance for socio-economic and human development in sub-Saharan African countries, a fact reflected by both forming the core of the UN's Millennium Development Goals or measures such as the Human Development Indicator (HDI) as well as Zambia's national development plan (NDP). For the purposes of this analysis, therefore, information on distance to the nearest health facility and nearest basic education facility for each household in each round of the LCMS is extracted.

Another priority sector in Zambia, as in other sub-Saharan countries, is the roads sector, as lack of access to markets (but also health, education, information, etc.) has for a long time been identified as one of the major impediments to rural development in African countries (see, for instance, Riverson / Gaviria / Thriscutt 1991). Unfortunately, only the 1996 LCMS records distances to the nearest road. In 1998 this measure was replaced with the reported distance to the nearest public transport facility (such as bus or railway stops). In want of a more direct measure of access to the road network, this item is used to approximate distances to publicly provided transport infrastructure.

Based on household information on distances to the nearest of each of these facilities (transport, health, basic education),[91] I calculate average distances from households in a constituency to the nearest facility of each type. Table B.2 shows the averages over 150 constituency average distances to each type of infrastructure by district type (rural, municipal, and city districts).

Table B.2: Grand mean constituency average reported distances to nearest transport, health, and education facility by district type

	1998			2006			2010		
	Trans	Health	Edu	Trans	Health	Edu	Trans	Health	Edu
City	.41 km	.96 km	.47 km	.60 km2	1.81 km	.93 km	.40 km	1.94 km	.61 km
Municipal	5.50 km	5.63 km	1.90 km	2.83 km	3.56 km	1.41 km	2.27 km	3.00 km	1.28 km
Rural	8.88 km	7.97 km	2.61 km	6.53 km	6.51 km	2.28 km	5.91 km	6.09 km	1.82 km
Zambia	7.16 km	6.65 km	2.21 km	5.05 km	5.33 km	1.94 km	4.47 km	4.94 km	1.57 km

Source: LCMS 1998, 2006, 2010

91 Using information provided by persons identified in the LCMS as household heads.

Infrastructure projects The LCMS questionnaire also includes a question on projects undertaken in a household's community. In 1998, the question in the survey was formulated as "*Have the following projects or changes occurred in your community in the last five years?*" followed by a list of 24 projects/changes, including the construction of a new facility (including schools, health facilities and roads) as well as rehabilitation/improvement of existing ones (distinguishing between grading and tarring existing roads). In 2006 the reporting period for this question was reduced to the past 12 months and the 2010 LCMS introduced an additional distinction between rehabilitation and extension (improvement) of existing facilities.[92]

From this (again, using information provided by the individual identified in the survey as "household head"), I construct dummy variables (taking the value 1 if a project has occurred) for each sampled household in each of the three sectors (roads, health, education) and for each type of project, i.e. whether a new facility/road has been built in the household's community, and whether an existing facility or road has been improved/rehabilitated. In addition, for each sector I construct an analogous dummy variable if either of the two types of projects (construction or improvement/rehabilitation) has taken place in each sector; and similar dummy variables for projects undertaken in at least one of the three sectors, i.e. a construction dummy that takes the value 1 if a household reports a school, a health facility or a road being built, and an improvement/rehabilitation dummy that takes the value 1 if an improvement/rehabilitation project has taken place in at least one of the three sectors. This generates a total of 12 dummy variables for each sampled household with the value 1 if the following project is reported:

- basic school constructed
- health facility constructed
- road built
- basic school rehabilitated/improved
- health facility rehabilitated/improved
- road rehabilitated/improved
- basic school built and/or rehabilitated/improved
- health facility built and/or rehabilitated/improved
- road built or rehabilitated/improved
- any of these: basic school, health facility, road built
- any of these: basic school, health facility, road rehabilitated/improved
- any of these: basic school, health facility, road built or rehabilitated/improved

From these dummy variables, the share of households in each SEA and each constituency reporting a project is then calculated. Tables B.3, B.4 and B.5 show the average constituency share of households reporting projects in each of the three sectors by province, and Table B.6 for the cross-sector reporting shares.

92 In the 2010 LCMS, the information on road projects became more detailed as well, distinguishing between building of a tar road; building of a gravel road; extension of a tar road; rehabilitation of a tar road; and rehabilitation of a gravel road.

Table B.3: Mean share of households per constituency reporting road projects (by province)

	1998			2006			2010		
	improved	built	any	improved	built	any	improved	built	any
Central	17.5	1.4	18.6	23.5	4.3	25.3	13.2	3.9	15.2
Copperbelt	13.4	4.7	14.2	14.2	3.8	16.4	11.4	5.0	15.1
Eastern	10.7	1.1	11.3	30.2	3.4	31.5	20.5	5.4	23.9
Luapula	12.2	0.4	12.4	25.9	2.3	26.7	24.2	4.3	26.5
Lusaka	34.3	6.6	37.5	26.7	6.4	28.4	15.6	7.7	20.7
North-Western	15.1	1.7	15.8	27.5	4.4	28.7	14.3	12.2	22.8
Northern	9.8	1.3	10.7	22.5	3.4	23.6	21.3	9.6	25.6
Southern	19.7	1.0	20.4	14.5	2.9	15.6	18.4	8.9	23.9
Western	9.2	0.8	9.4	24.8	9.4	26.2	5.7	2.4	6.7
Zambia	15.0	2.1	15.8	22.7	4.4	24.1	16.1	6.5	20.0

Table B.4: Mean share of households per constituency reporting health projects (by province)

	1998			2006			2010		
	improved	built	any	improved	built	any	improved	built	any
Central	5.9	5.2	9.6	15.7	7.5	20.4	5.2	10.1	17.5
Copperbelt	18.9	5.9	22.4	11.6	7.0	16.3	8.4	3.4	12.8
Eastern	17.0	8.0	23.5	23.1	10.3	30.5	15.4	15.3	27.2
Luapula	14.9	10.5	21.4	30.3	5.2	33.5	9.4	10.9	21.2
Lusaka	22.9	11.4	31.7	20.4	12.8	26.2	7.4	8.3	21.3
North-Western	14.0	9.6	20.6	19.7	8.9	23.9	7.9	7.6	13.4
Northern	15.3	4.7	18.8	20.5	15.4	28.6	17.1	13.3	27.7
Southern	17.6	10.2	26.9	20.0	7.6	24.4	10.8	9.3	21.3
Western	7.0	2.1	8.9	11.1	8.0	17.9	7.4	14.3	22.0
Zambia	15.0	7.2	20.4	18.8	9.3	24.4	10.4	10.3	20.8

Table B.5: Mean share of households per constituency reporting education projects (by province)

	1998			2006			2010		
	improved	built	any	improved	built	any	improved	built	any
Central	16.4	11.4	24.6	28.3	4.3	30.4	19.3	11.0	35.4
Copperbelt	37.5	12.4	44.0	15.5	7.1	19.8	10.2	10.2	21.1
Eastern	34.3	10.8	42.0	43.5	14.6	50.2	23.0	13.7	43.4
Luapula	36.9	7.3	41.6	41.3	15.7	49.8	23.9	22.5	48.0
Lusaka	35.0	16.5	44.8	25.6	14.2	33.2	9.1	9.5	20.1
North-Western	32.1	18.9	40.8	28.2	8.6	31.4	19.0	18.2	35.5
Northern	33.3	7.7	37.6	33.0	22.2	43.3	32.2	22.9	51.5
Southern	26.1	10.6	29.8	27.2	12.0	33.5	17.3	9.8	31.3
Western	28.7	5.9	32.3	25.6	4.5	29.0	9.8	11.2	28.0
Zambia	31.4	10.9	37.5	29.5	11.7	35.5	18.5	14.3	35.2

Table B.6: Mean %-share of households per constituency reporting any project (by province)

	1998			2006			2010		
	improved	built	any	improved	built	any	improved	built	any
Central	30.4	15.6	39.1	47.9	13.7	51.5	42.5	20.3	48.4
Copperbelt	47.0	18.4	52.9	31.3	14.7	36.9	26.9	14.9	33.2
Eastern	46.7	17.2	57.6	63.3	22.7	69.2	53.0	28.2	61.7
Luapula	48.2	17.5	56.1	60.8	20.7	68.9	52.2	29.7	60.0
Lusaka	59.1	27.4	65.8	43.8	24.1	50.5	33.0	20.0	38.8
North-Western	43.8	24.8	53.6	51.2	16.6	54.8	39.0	28.1	48.6
Northern	40.9	12.4	45.8	48.7	30.2	58.3	56.5	35.5	68.1
Southern	44.3	20.3	52.9	43.3	18.2	48.6	40.0	22.5	48.0
Western	37.4	8.6	40.9	40.4	16.3	45.5	22.9	24.4	39.7
Zambia	43.9	17.4	51.2	47.2	19.9	53.3	40.8	24.9	49.9

Needs / preferences The LCMS includes a question that asks household heads to rank, by priority, the top four infrastructure construction or improvement projects they would like to see take place in their community. This question was also adjusted over the years: in 1998 households were asked to give their four top priorities and given the option to choose between construction of a new facility or improvement of an existing one for each. In 2006 and 2010, households were asked to rank their top four priorities for new infrastructure construction and their four top priorities for infrastructure improvement. Choices include a road to be built; a road to be rehabilitated/improved; a road to be tarred or resurfaced; a health centre or clinic to be built; a hospital to be built; a health centre or clinic to be rehabilitated/improved; a hospital to be rehabilitated/improved; a primary school to be built; and a primary school to be rehabilitated/improved. From this information I construct a set of variables that record the share of households in a constituency that name construction of a road, health or education facility, respectively, as their first priority or as one of their top three priorities.

B.2 Census data

The Central Statistical Office of Zambia carried out a Census of Population and Housing for the first time in 1990; a second and third census were conducted in 2000 and 2010. Only the 2000 census data was available at the time of writing. This data includes information on individuals' self-reported ethnicity as well as their predominant language of communication. Both variables are coded according to the same 61 local languages, grouped into seven main language groups (Bemba, Tonga, North-Western, Barotse, Nyanja, Mambwe, Tumbuka).[93] Based on this information, I construct two variables for the ethnic composition of each constituency's population: the share of households in a constituency belonging to each of the seven main language groups; and a binary ethnic dominance variable that is 1 if at least 30 per cent of households in a constituency belong to one of the seven main language groups. Table B.7 shows the distribution of language group dominance across constituencies and provinces.

Table B.7: Number of constituencies dominated by language groups ($\geq$ 30%) per province

Province	Bemba	Tonga	North-Western	Barotse	Nyanja	Mambwe	Tumbuka	Total
Central	8	6	0	0	1	0	0	14
Copperbelt	22	0	0	0	0	0	0	22
Eastern	0	0	0	0	15	0	5	19
Luapula	14	0	0	0	0	0	0	14
Lusaka	0	1	0	0	12	0	0	12
Northern	15	0	0	0	0	5	1	21
North-Western	1	0	12	0	0	0	0	12
Southern	0	18	0	0	0	0	0	19
Western	0	0	5	17	0	0	0	17
Total	60	25	17	17	28	5	6	150

Source: Census 2010

93 In addition to these 61 categories, the language group classification includes the two categories "English" and "other language" as well as the "major racial groups" African, American, Asian and European.

B.3 Election data

Detailed information on election outcomes is available from the website of the Electoral Commission (ECZ) of Zambia.[94]

In 2010, the National Assembly of Zambia had 158 members, of which 150 were elected in the constituencies and 8 were nominated by the president of the Republic. Election results are reported at the constituency level and include information on party affiliation of the elected Member of Parliament (MP) from that constituency. The president of the Republic is elected by popular vote for a five-year term and is only eligible for one second term.

The available data covers election results for presidential and parliamentary elections since 1991 and for local government (council) elections since 2001, all of which regularly take place every five years.[95] For the purposes of this paper, I retrieved electoral results by constituency from the ECZ's website for presidential elections in 1996, 2001, 2006, 2008 and 2011, and for the 2001 and 2006 parliamentary elections.

The information contains some missing values such as, for instance, for two constituencies (Kabompo East and Lupososhi), where parliamentary elections in 2006 had to be postponed due to the death of two candidates; the results of the subsequent by-elections are not reported on the ECZ's website.

94 Available at: http://www.elections.org.zm (accessed 3 Oct. 2013).

95 In 2008, after the sudden death of President Mwanawasa, presidential by-elections were held and won by former Vice President Rupiah Banda in October 2008. The most recent regular elections were held in 2011 and won by the opposition Patriotic Front's candidate, Michael Sata, one of the founders of the MMD.

C Description and rationale of control variables

Ideally, the government should invest in infrastructure either where it is needed most and/or where it can be expected to benefit the highest number of people possible (Pietschmann 2014). If the government is committed to poverty reduction, it can be expected that the poorest areas should receive over-proportional infrastructure investment. As a measure of general deprivation, I therefore control for poverty incidence at the constituency level (headcount index calculated using LCMS information).

As an additional – and arguably more direct – measure of constituencies' relative need for social infrastructure investment, I also control for access to health and education facilities, prior to the respective LCMS reporting period, by including the average reported distance of households within a constituency to the next facility of the relevant type in the preceding LCMS (i.e. distances reported in the 1996 survey for the 1998 cross-section; distances from the 1998 LCMS for the 2006 cross-section; and distances from the 2006 survey for the 2010 cross-section).[96] Unfortunately, for road infrastructure, distance to the next road is only recorded in the 1996 LCMS. The later surveys do not include this information, but they do include the reported distance to the nearest public transport facility (such as bus stops). In want of a more direct measure of access to roads, this distance is used to approximate road infrastructure deprivation.

Constituencies may not only differ with respect to their needs but also their preferences for different types of infrastructure, which may – but does not have to – reflect relative deprivation. As long as the government knows about these preferences, it may decide to provide different types of infrastructure according to these preferences. For robustness checks, I therefore also include the share of households in a constituency that name construction of a road, health or education facility, respectively, as their first priority or as one of their top three priorities for infrastructure projects to be undertaken in their community (see Appendix B.1).

Alternatively, the central government's investment decisions may be driven not only by constituencies' needs but also by efficiency considerations. For instance, if the government is interested in exploiting economies of scale in its infrastructure provision, densely populated areas might be expected to receive more investment, as in these areas a larger number of house-

96 Evidently, it would be desirable to also use more direct measures of deprivation or needs in health and education as well, such as child mortality or basic education enrolment rates. Child mortality data at the constituency level was obtained from the government's health management information system, but including measures such as under-five child mortality as regressors in the estimates did not yield significant coefficients and were thus dropped. However, there are not only empirical but also important conceptual considerations as to why child mortality or other available measures of health service deprivation may not be used as explanatory variables. This is because this kind of administrative data is typically subject to substantial reporting due to the fact that the respective statistics rely on health posts and hospitals reporting them. This implies that, in general, the recorded figures tend to be *higher*, the better the accessibility and utilisation of such facilities in an area. With regard to education, basic education enrolment rates are not readily available at the constituency level for Zambia. Moreover, official enrolment rates for Zambia seem to be highly flawed, with available data at the district level showing net enrolment ratios higher than 100 per cent in several cases, which is impossible by definition and most likely due to inadequate enrolment and population data (see de Kemp 2011, 48). In view of these limitations, the information derived from earlier LCMSs on access to infrastructure appears to be the better choice to control for social service deprivation.

holds will be aware of and benefit from improved or newly established facilities.[97] Population density data at the district level is available from census information for 1990, 2000 and 2010.

At the same time, based on this efficiency argument (and other reasons), it is to be expected that investments in infrastructure were already higher in urban areas in the past. Access in general will therefore be better in towns and cities than in rural areas, not only due to the higher population density but also due to the simple fact that more facilities already exist in urban areas.[98]

This supposition is supported by the average reported distances by district type shown in Table B.2 in Appendix B.1, which shows substantially shorter distances to transport, health and basic education facilities in cities and municipal districts than in rural ones. This pronounced urban-rural divide in access facilities can, of course, be expected to have an influence on the kinds of infrastructure projects undertaken in different areas: in urban areas there might be more need for rehabilitation and improvement of existing infrastructure, whereas in underserved rural areas, construction of new facilities might be required. To account for this likely rural-urban bias in investment decisions, the LCMS classification of districts as rural, urban or city (as opposed to rural) districts is thus also included in the form of dummy variables in the model.

The topography, climate, connection to national roads or waterways, and other geographic factors might also influence the provision of public infrastructure. An inspection of the average share of households per constituency reporting road, health and education projects, or any project within each province (Tables B.3, B.4, B.5 and B.6 in Appendix B.1) shows that reported infrastructure investment varies widely between provinces and over the years.[99] To control for this heterogeneity, I include dummies for eight of the nine provinces in the empirical model.[100]

At the same time, it cannot be ruled out that the central government might discriminate between ethnic groups and direct public investment towards constituencies that are dominated by particular ethnic groups. Variables on the ethnic composition of constituencies can be constructed using information from the year 2000 census on a household head's first language as an indicator of the household's ethnicity. To control for ethnic group dominance, I construct two variables for the ethnic composition of each constituency's population: the share of households in a constituency belonging to each of the seven main language groups; and a binary ethnic dominance variable that is 1 if at least 30 per cent of households in a constituency belong to one of the seven main language groups.

97 As discussed in Section 2.2.1 in the main text, population density should also be controlled for to avoid a biased measure of infrastructure investment due to a higher rate of multiple reporting on the same facilities in more densely populated areas.

98 For instance, in the case of health, higher-tier facilities such as referral hospitals, are predominantly located in regional and national hubs, such as provincial capitals. Moreover, the economic base in urban districts might equip local authorities with own resources to provide social infrastructure, which the proposed measure for infrastructure investment (share of households reporting investment) does not distinguish.

99 Remarkably, in spite of the 1998 LCMS reporting projects over the previous five years, versus 12 months in the 2006 and 2010 LCMSs (see Appendix B.1), the national average is lower in 1998 than in the two subsequent surveys.

100 Because there is no administrative tier making spending decisions at the provincial level in Zambia, province dummies serve merely as geographic controls and do not measure differences in institutional performance between regions.

There are, however, two important difficulties with controlling for ethnic composition of constituencies. For one, including both province dummies and information on ethnicity may pose a problem, as the ethnic groups tend to be concentrated in particular regions. Province dummies used to control for geographic differences are thus likely to be highly correlated with the presence or dominance of different language groups, although this should not affect the results for the explanatory variable of interest, namely the electoral success of the ruling party.

As Table B.7 in Appendix B.2 shows, the geographic concentration of ethnic groups by provinces is indeed very high. In fact, some province / language group dummies form perfect linear combinations that would cause a collinearity problem if all were jointly included in a regression.[101] To account for this problem, the Western province is taken as the (excluded) reference group for the province dummies. For the ethnic-dominance dummies, the Barotse, Mambwe and Tumbuka groups are grouped together and form the excluded category.

As an alternative measure of geographic location and remoteness for robustness checks, I also construct two variables measuring the distance by road from each district capital to the national capital and the provincial capital, respectively.[102]

The second – and arguably more important – difficulty with including information on ethnicity is a conceptual rather than an empirical one: as in most African nations, party (or candidate) preferences in Zambia are closely associated with ethnicity (see Lindemann 2011). It is, of course, also possible that the government targets constituencies according to their ethnic composition instead of – or in addition to – their voting behaviour. By including information on language groups in the regression, it is possible to separate these effects and isolate the partial influence that voting behaviour has on allocation decisions after controlling for the effect of ethnic composition (assuming that ethnic composition cannot predict electoral outcomes perfectly). Yet, it is not *a priori* clear whether separating these effects is necessarily in line with the research interest of this paper. If the main interest is with estimating the extent to which allocations are subject to political motives (and these motives are in line with the core-voter model), the question of whether the government bases its allocation decisions on potential (ethnicity) or actual (votes) political support may not be of prime importance nor empirically relevant, given the (to be expected) high correlation of the two.[103] In this case ethnicity information should be excluded from the regression and voting behaviour should be allowed to capture the influence of ethnicity.[104] In turn, if the main interest is in testing the core-voter versus the swing-voter model – as is the case with this paper – then the effect of ethnic composition acting through voting behaviour might supersede the pure-voting effect and make it impossible to detect swing-voter targeting. In this case, ethnic information should be included.

101 All 17 constituencies in the Western province have at least 30 per cent of households belonging to the Barotse language group. *Vice versa*, all 17 constituencies with at least 30 per cent of households belonging to the Barotse group are located in the Western province. Similarly, of the 21 constituencies in the Northern province, 15 have at least 30 per cent of households belonging to the Barotse language group. Of the 6 constituencies that do not, 5 have at least 30 per cent Mambwe-speaking households, which at the same time are the only 5 Mambwe-dominated constituencies nation-wide. The remaining constituency in the Northern province is Tumbuka-dominated, as only 5 other constituencies are (all in the Eastern province).

102 Distances by road were constructed using the routing function of Google Maps™ mapping service.

103 If the main motive behind targeting constituencies loyal to the incumbent is to mobilise supporters to vote, then allocation based on ethnic composition would be perfectly rational from the government's point of view.

104 Or *vice versa*.

There is thus a possible trade-off between investigating the general research interest of this paper – namely whether the distribution of social infrastructure provision in Zambia is driven by political motives – and the more specific question of whether such a politically motivated distribution follows the swing-voter or the core-voter theorem. Here, the main interest is on the latter, which is why language information is included in the main regressions and only excluded for robustness checks.

D Regression results

Table D.1: Vote margins and infrastructure provision: cross-section results

	Parliamentary Elections			Presidential Elections		
	1998	2006	2010	1998	2006	2010
won MMD	–1.993	–11.610*	–8.657	9.986	–5.389	3.265
	(8.91)	(6.53)	(6.34)	(12.44)	(5.90)	(5.33)
margin	.269	–.302*	–.284**	.885**	–.159	–.077
	(.29)	(.18)	(.14)	(.35)	(.11)	(.14)
won x margin	–.047	.528**	.566***	–.905**	.437**	.228
	(.31)	(.25)	(.19)	(.39)	(.21)	(.17)
access trans	–2.527***	–.142	–.546	–2.068**	–.145	–.481
	(.81)	(.15)	(.46)	(.84)	(.15)	(.50)
access health	–3.112	–.034	–.069	1.318	–.071	–.020
	(8.71)	(.28)	(.71)	(7.05)	(.27)	(.71)
access edu	.640	.210	–.740	.501	.174	–.230
	(1.43)	(.81)	(1.06)	(1.40)	(.88)	(1.11)
Municipal	5.566	–12.176***	–4.354	3.654	–12.141***	–5.477
	(5.34)	(4.37)	(3.89)	(5.48)	(4.24)	(3.76)
City	3.939	–22.629***	8.200	–5.140	–19.967**	9.028
	(14.70)	(8.23)	(7.00)	(14.79)	(9.28)	(6.43)
poverty	3.812	.246**	.184	–7.719	.238**	.151
	(16.55)	(.10)	(.12)	(16.93)	(.11)	(.12)
pop density	.003	.001	–.003	.005	–.000	–.002
	(.01)	(.00)	(.00)	(.01)	(.00)	(.00)
sqrt pop	–.001	–.039**	–.048*	.016	–.036*	–.040
	(.06)	(.02)	(.02)	(.07)	(.02)	(.03)
Provinces						
Central	–17.949	46.050***	17.685*	–10.678	43.926***	21.316**
	(11.78)	(12.58)	(10.10)	(11.48)	(11.73)	(10.23)
Copperbelt	–9.861	44.220***	14.431	1.386	39.686***	20.659*
	(9.79)	(10.38)	(12.21)	(9.35)	(10.87)	(11.78)
Eastern	18.258	38.291***	33.881***	29.308***	35.824***	38.335***
	(11.18)	(6.77)	(8.53)	(10.12)	(6.17)	(9.41)
Luapula	5.776	55.429***	37.323***	6.480	51.255***	46.133***
	(8.79)	(11.81)	(9.80)	(9.53)	(11.79)	(10.16)
Lusaka	22.639	39.003***	20.281	30.470*	35.175***	24.060*
	(17.70)	(13.11)	(13.06)	(16.06)	(11.72)	(13.38)
Northern	–8.407	43.771***	46.166***	1.668	39.606***	49.630***
	(7.08)	(8.78)	(7.34)	(7.20)	(9.22)	(7.20)
North-Western	7.594	–14.203	–3.476	3.053	–10.927	1.459
	(4.62)	(9.70)	(18.95)	(5.50)	(9.18)	(18.87)
Southern	–5.717	55.976***	21.474*	1.366	52.571***	25.431**
	(13.05)	(12.37)	(11.27)	(12.76)	(11.74)	(11.90)
Language Groups (≥ 30 %)						
Bemba	10.901**	–21.872***	–6.807	12.015**	–23.631***	–6.160
	(5.19)	(7.72)	(7.28)	(5.99)	(7.82)	(7.78)
Tonga	13.070	–28.065**	6.022	13.624	–28.601***	7.305
	(10.22)	(11.77)	(9.99)	(10.13)	(10.29)	(11.16)
North-Western	–1.112	38.707***	21.465	7.275	35.441***	17.273
	(5.88)	(9.83)	(19.77)	(5.68)	(9.32)	(20.01)
Nyanja	–9.603	1.185	.951	–12.195	3.555	.224
	(12.35)	(6.06)	(6.49)	(10.94)	(4.94)	(6.38)
Constant	36.823**	29.646***	37.095***	31.980**	28.035**	24.166*
	(15.94)	(10.44)	(12.89)	(15.73)	(11.38)	(12.95)
N	144	149	148	146	149	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.2: Vote margins and infrastructure provision: rural and municipal constituencies (panel)

	Parliamentary			Presidential		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
won MMD	–8.580*	–8.410*	–7.449	–.088	–.166	–1.661
	(4.39)	(4.30)	(4.54)	(4.25)	(4.07)	(5.09)
margin	–.244**	–.248**	–.152	–.103	–.109	–.127
	(.12)	(.12)	(.14)	(.11)	(.10)	(.13)
won x margin	.393***	.393***	.319**	.066	.075	.055
	(.15)	(.15)	(.16)	(.13)	(.12)	(.15)
2006	–12.222	–12.078	–22.019**	–16.830*	–16.489*	–28.502***
	(9.32)	(9.51)	(8.64)	(9.36)	(9.91)	(9.34)
2010	–12.954	–12.739	–19.323**	–16.405*	–16.046*	–22.510**
	(8.37)	(8.47)	(8.59)	(8.56)	(8.98)	(9.15)
access trans	–.309*	–.298**	–.044	–.277	–.269*	.025
	(.18)	(.14)	(.18)	(.19)	(.14)	(.19)
access health	.426	.416	.898**	.396	.391	.736*
	(.32)	(.29)	(.35)	(.35)	(.31)	(.38)
access edu	–.535	–.520	–.317	–.460	–.452	–.002
	(.75)	(.67)	(.85)	(.78)	(.70)	(.89)
Municipal	–4.557	–4.540*		–4.166	–4.222	
	(3.14)	(2.60)		(3.16)	(2.65)	
poverty	.307***	.306***	.407***	.341***	.338***	.459***
	(.10)	(.10)	(.10)	(.10)	(.10)	(.11)
pop density	.061	.061	.053	.043	.044	–.254
	(.07)	(.05)	(.32)	(.07)	(.05)	(.32)
sqrt pop	–.041**	–.042**	–.066*	–.038**	–.039**	–.068*
	(.02)	(.02)	(.03)	(.02)	(.02)	(.03)
Provinces						
Central	18.078**	17.745***		20.499**	19.815***	
	(8.27)	(6.32)		(8.78)	(6.60)	
Copperbelt	18.526**	18.198**		24.144**	23.381***	
	(9.15)	(8.16)		(9.48)	(8.14)	
Eastern	30.343***	29.934***		31.374***	30.681***	
	(9.41)	(5.69)		(9.32)	(5.73)	
Luapula	34.244***	33.890***		35.468***	34.961***	
	(7.80)	(6.45)		(7.86)	(6.40)	
Lusaka	30.842***	30.448***		32.141***	31.425***	
	(11.09)	(7.98)		(11.03)	(7.91)	
Northern	28.330***	27.956***		30.011***	29.327***	
	(6.37)	(4.82)		(7.08)	(5.34)	
North-Western	–.480	–.610		–.465	–.627	
	(4.95)	(4.26)		(4.70)	(3.99)	
Southern	25.686***	25.545***		26.469**	26.117***	
	(9.80)	(7.01)		(10.80)	(7.62)	
Language Groups (≥ 30 %)						
Bemba	–8.385	–8.451*		–8.740	–8.790*	
	(5.92)	(4.68)		(6.00)	(4.69)	
Tonga	–6.227	–6.228		–6.880	–6.862	
	(9.08)	(6.18)		(9.51)	(6.31)	
North-Western	18.965***	18.906***		19.785***	19.474***	
	(4.78)	(4.11)		(5.04)	(4.27)	
Nyanja	–3.313	–3.324		–3.192	–3.170	
	(9.12)	(6.29)		(8.54)	(5.83)	
Constant	40.931***	41.366***	57.725***	37.338***	38.150***	67.416***
	(4.64)	(4.13)	(10.31)	(5.96)	(5.15)	(11.43)
N	390	390	390	394	394	394

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.3: Vote margins and infrastructure provision: rural constituencies (panel)

	Parliamentary			Presidential		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
won MMD	–12.536***	–12.300***	–11.877**	1.569	1.542	–.270
	(4.75)	(4.57)	(4.49)	(4.92)	(4.86)	(5.87)
margin	–.337***	–.339***	–.279**	–.122	–.124	–.146
	(.12)	(.10)	(.13)	(.10)	(.10)	(.13)
won x margin	.540***	.537***	.492***	.073	.079	.082
	(.14)	(.12)	(.14)	(.12)	(.12)	(.16)
2006	1.900	2.136	–15.345	–1.212	–.784	–19.321
	(11.16)	(11.82)	(11.19)	(12.00)	(12.75)	(13.15)
2010	–1.331	–.990	–16.111	–3.249	–2.800	–16.895
	(10.18)	(10.63)	(10.21)	(11.14)	(11.62)	(11.76)
access trans	–.450**	–.439***	–.173	–.402**	–.394***	–.086
	(.19)	(.14)	(.18)	(.20)	(.15)	(.20)
access health	.567*	.552*	.958***	.521	.511*	.794**
	(.33)	(.30)	(.34)	(.35)	(.31)	(.36)
access edu	–.445	–.421	–.517	–.319	–.307	–.081
	(1.01)	(.79)	(.97)	(1.08)	(.84)	(1.00)
poverty	.204	.203	.409***	.221*	.218	.437***
	(.13)	(.14)	(.13)	(.13)	(.14)	(.14)
pop density	–.052	–.051	.399	–.052	–.050	–.001
	(.16)	(.11)	(.57)	(.16)	(.11)	(.63)
sqrt pop	–.041*	–.042**	–.074**	–.036	–.038*	–.075**
	(.02)	(.02)	(.04)	(.02)	(.02)	(.04)
Provinces						
Central	11.540	11.153**		13.988*	13.104**	
	(7.81)	(5.61)		(8.07)	(5.68)	
Copperbelt	15.051	14.627*		19.753*	18.734**	
	(10.52)	(8.71)		(10.79)	(8.84)	
Eastern	32.161***	31.650***		33.005***	32.130***	
	(9.79)	(5.72)		(9.40)	(5.80)	
Luapula	30.129***	29.681***		31.166***	30.438***	
	(7.93)	(6.36)		(7.58)	(5.79)	
Lusaka	31.058***	30.573***		31.486***	30.618***	
	(9.72)	(7.63)		(9.52)	(7.60)	
Northern	22.759***	22.293***		23.695***	22.797***	
	(5.38)	(3.64)		(5.90)	(3.84)	
North-Western	–.175	–.240		–.360	–.485	
	(5.34)	(4.58)		(5.28)	(4.36)	
Southern	23.766***	23.365***		24.303***	23.460***	
	(9.03)	(6.38)		(9.32)	(6.81)	
Language Groups (≥ 30 %)						
Bemba	–1.257	–1.324		–1.484	–1.519	
	(6.04)	(4.21)		(5.73)	(3.63)	
Tonga	.544	.512		–.223	–.181	
	(7.58)	(4.95)		(7.60)	(4.88)	
North-Western	20.543***	20.348***		21.184***	20.670***	
	(4.41)	(3.77)		(5.27)	(4.36)	
Nyanja	–3.993	–4.017		–3.688	–3.702	
	(8.77)	(6.71)		(8.05)	(6.13)	
Constant	39.617***	40.092***	56.201***	32.774***	33.637***	58.651***
	(5.19)	(4.37)	(8.55)	(6.32)	(5.18)	(9.28)
N	291	291	291	295	295	295

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.4: Vote margins and infrastructure provision: rural and municipal constituencies (cross-sections)

	Parliamentary Elections			Presidential Elections		
	1998	2006	2010	1998	2006	2010
won MMD	–5.100	–8.828	–7.597	11.385	–2.088	5.491
	(9.08)	(7.29)	(6.49)	(10.71)	(6.41)	(5.40)
margin	.161	–.258	–.216	1.130***	–.126	.072
	(.37)	(.18)	(.15)	(.35)	(.11)	(.14)
won x margin	.021	.436*	.520***	–1.152***	.344	.139
	(.38)	(.25)	(.19)	(.36)	(.24)	(.17)
access trans	–2.505***	–.154	–.559	–1.980**	–.159	–.551
	(.86)	(.15)	(.46)	(.87)	(.14)	(.52)
access health	1.572	.012	.024	10.226	–.012	.096
	(11.88)	(.28)	(.75)	(8.85)	(.27)	(.73)
access edu	1.264	.149	–1.209	1.327	.117	–.685
	(1.52)	(.82)	(1.12)	(1.48)	(.87)	(1.10)
Municipal	.915	–13.310***	–5.619	–1.613	–14.122***	–7.980*
	(5.43)	(5.06)	(3.93)	(6.01)	(4.83)	(4.30)
poverty	6.085	.317***	.187	–5.281	.326**	.153
	(17.63)	(.12)	(.13)	(18.10)	(.13)	(.13)
pop density	.180***	.043	.029	.183**	.080	.068
	(.07)	(.07)	(.07)	(.08)	(.08)	(.07)
sqrt pop	–.052	–.043*	–.046	–.054	–.043*	–.038
	(.08)	(.02)	(.03)	(.08)	(.02)	(.03)
Provinces						
Central	–13.167	40.457***	13.427	–5.195	37.076***	15.982
	(13.09)	(14.59)	(11.24)	(12.65)	(13.84)	(11.45)
Copperbelt	–14.043	41.570***	10.636	–3.696	34.549***	14.228
	(10.67)	(12.50)	(14.38)	(10.08)	(13.01)	(13.87)
Eastern	18.338	39.305***	32.929***	29.612***	37.143***	39.035***
	(11.07)	(6.76)	(8.83)	(9.91)	(6.25)	(9.59)
Luapula	11.099	51.901***	34.624***	10.687	46.707***	42.730***
	(9.01)	(12.31)	(10.16)	(9.79)	(12.49)	(10.65)
Lusaka	26.715	39.181***	18.965	35.479**	36.339***	24.048*
	(18.09)	(12.52)	(13.11)	(16.67)	(11.21)	(12.91)
Northern	–3.267	41.196***	44.474***	6.823	36.366***	47.959***
	(7.57)	(9.48)	(7.75)	(7.51)	(10.16)	(7.46)
North-Western	9.521*	–12.575	–3.918	4.379	–9.914	2.518
	(4.86)	(9.76)	(19.13)	(5.42)	(9.23)	(18.94)
Southern	4.136	46.544***	15.078	11.802	41.904***	13.976
	(14.41)	(14.72)	(13.66)	(13.38)	(13.83)	(15.10)
Language Groups (≥ 30 %)						
Bemba	6.028	–18.813**	–5.015	7.592	–20.152**	–3.351
	(4.95)	(8.24)	(7.74)	(5.53)	(8.66)	(8.17)
Tonga	5.000	–20.631	9.867	5.701	–19.905*	13.264
	(10.36)	(12.81)	(11.77)	(9.88)	(11.49)	(12.40)
North-Western	–1.378	37.356***	21.913	7.554	34.494***	16.872
	(6.30)	(9.97)	(19.90)	(5.32)	(9.46)	(20.11)
Nyanja	–11.602	–.631	.510	–13.696	.550	–.919
	(12.05)	(5.85)	(6.71)	(11.17)	(4.80)	(6.85)
Constant	40.374**	23.205*	35.662**	29.992*	20.797	19.104
	(17.01)	(12.83)	(14.08)	(16.16)	(14.44)	(14.01)
N	127	132	131	129	132	133

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.5: Vote margins and infrastructure provision: rural constituencies (cross-sections)

	Parliamentary Elections			Presidential Elections		
	1998	2006	2010	1998	2006	2010
won MMD	–10.745	–12.743	–9.928	15.243	–1.277	11.776*
	(9.88)	(7.71)	(7.37)	(28.32)	(7.04)	(6.38)
margin	.402	–.284*	–.263	1.579	–.116	.245
	(.43)	(.17)	(.17)	(1.57)	(.10)	(.17)
won x margin	–.096	.507**	.585***	–1.632	.417	.028
	(.44)	(.23)	(.21)	(1.58)	(.25)	(.20)
access trans	–2.896***	–.359**	–.689	–2.220**	–.347**	–.750
	(.96)	(.15)	(.52)	(.95)	(.14)	(.59)
access health	–5.569	.419*	.081	8.502	.332	.047
	(17.55)	(.23)	(.89)	(11.49)	(.24)	(.82)
access edu	1.343	.119	–1.001	.785	.170	.006
	(1.70)	(.87)	(1.55)	(1.79)	(.97)	(1.47)
poverty	–17.304	.407**	.113	–31.775	.439**	.085
	(21.89)	(.16)	(.16)	(22.03)	(.19)	(.16)
pop density	.337	–.334**	–.034	.167	–.255**	–.141
	(.30)	(.13)	(.16)	(.27)	(.12)	(.21)
sqrt pop	–.047	–.046*	–.041	–.017	–.047*	–.027
	(.10)	(.03)	(.04)	(.11)	(.03)	(.04)
Provinces						
Central	–25.865*	32.372**	5.324	–13.859	27.766*	7.660
	(14.53)	(14.44)	(12.12)	(13.40)	(14.70)	(12.59)
Copperbelt	–29.808**	40.397***	2.456	–14.567	31.115**	1.653
	(14.35)	(11.74)	(18.17)	(11.96)	(12.91)	(18.97)
Eastern	14.737	50.420***	31.537***	28.429***	48.035***	42.184***
	(10.61)	(6.46)	(9.30)	(8.85)	(5.48)	(8.91)
Luapula	–6.237	54.442***	25.757**	–4.820	46.775***	39.765***
	(13.22)	(11.44)	(12.00)	(11.68)	(11.34)	(11.82)
Lusaka	22.735	43.568***	17.149	31.314*	39.737***	23.348*
	(18.37)	(11.27)	(14.56)	(16.83)	(9.60)	(13.29)
Northern	–18.764*	40.218***	34.450***	–5.232	32.973***	40.979***
	(10.36)	(6.93)	(8.30)	(7.78)	(7.95)	(7.76)
North-Western	11.133**	–10.831	–1.824	6.225	–8.075	5.989
	(5.33)	(10.89)	(19.20)	(6.16)	(9.82)	(19.42)
Southern	–5.258	44.143***	9.991	6.526	37.796**	6.772
	(15.06)	(14.69)	(14.71)	(13.32)	(14.48)	(15.74)
Language Groups (≥ 30 %)						
Bemba	19.393***	–9.210	3.784	18.461***	–12.921*	6.275
	(6.96)	(6.20)	(7.75)	(6.36)	(7.22)	(7.90)
Tonga	11.752	–9.415	16.126	10.063	–8.008	22.206**
	(9.93)	(12.12)	(10.90)	(9.68)	(11.51)	(10.33)
North-Western	–6.336	40.886***	21.661	4.487	36.477***	16.312
	(8.39)	(10.42)	(19.42)	(6.91)	(10.12)	(20.32)
Nyanja	–18.787	.347	–.875	–19.297	1.491	–.355
	(13.42)	(6.22)	(8.25)	(12.12)	(4.89)	(7.22)
Constant	62.108***	14.503	43.134**	49.255*	8.982	14.875
	(17.95)	(15.83)	(18.01)	(26.31)	(18.66)	(16.89)
N	94	99	98	96	99	100

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.6: Vote shares and infrastructure provision: all constituencies (panel)

	Parliamentary			Presidential		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
votes MMD	–.073	–.054	–.000	–.149	–.144	–.131
	(.15)	(.15)	(.16)	(.15)	(.15)	(.16)
votes 2006	.240	.226	.216	.284	.284	.259
	(.23)	(.21)	(.24)	(.21)	(.20)	(.21)
votes 2010	.199	.180	.103	.249	.248	.140
	(.19)	(.18)	(.21)	(.19)	(.18)	(.20)
2006	–28.684**	–27.563**	–28.515**	–33.909**	–33.524**	–36.690**
	(12.59)	(11.91)	(14.06)	(13.86)	(13.53)	(15.68)
2010	–26.991**	–25.706**	–21.473	–32.664**	–32.298**	–28.307*
	(12.14)	(11.27)	(13.54)	(13.92)	(13.15)	(15.89)
access trans	–.248	–.238*	.012	–.254	–.245*	.042
	(.17)	(.14)	(.18)	(.17)	(.14)	(.17)
access health	.503	.492	.940**	.497	.491	.852**
	(.31)	(.30)	(.36)	(.32)	(.31)	(.38)
access edu	–.695	–.684	–.146	–.663	–.658	.097
	(.72)	(.68)	(.89)	(.73)	(.69)	(.88)
Municipal	–2.379	–2.389		–2.594	–2.628	
	(3.16)	(2.46)		(3.09)	(2.39)	
City	–3.344	–3.282		–3.297	–3.296	
	(12.54)	(5.36)		(12.22)	(5.18)	
poverty	.331***	.327***	.360***	.335***	.331***	.392***
	(.09)	(.08)	(.09)	(.09)	(.08)	(.09)
pop density	–.000	–.000	–.004	–.000	–.000	–.004
	(.03)	(.00)	(.00)	(.03)	(.00)	(.00)
sqrt pop	–.035**	–.036***	–.065**	–.036***	–.037***	–.067**
	(.01)	(.01)	(.03)	(.01)	(.01)	(.03)
	(.45)	(.43)	(.93)	(.44)	(.43)	(.93)
Provinces						
Central	20.688***	19.996***		22.713***	22.005***	
	(6.77)	(5.43)		(6.70)	(5.68)	
Copperbelt	25.213***	24.364***		27.239***	26.508***	
	(8.09)	(7.01)		(7.89)	(6.95)	
Eastern	33.671***	32.821***		34.870***	34.169***	
	(9.19)	(5.86)		(9.27)	(5.97)	
Luapula	34.608***	33.952***		36.974***	36.405***	
	(6.54)	(5.80)		(6.64)	(6.05)	
Lusaka	34.802***	33.963***		36.413***	35.661***	
	(10.97)	(7.65)		(10.88)	(7.61)	
Northern	30.275***	29.503***		31.636***	30.916***	
	(5.51)	(4.64)		(5.68)	(5.09)	
North-Western	–1.844	–2.022		–1.234	–1.444	
	(5.01)	(4.07)		(4.69)	(3.81)	
Southern	26.638***	26.057***		28.352***	27.825***	
	(7.83)	(5.34)		(8.00)	(5.65)	
Language Groups (≥ 30 %)						
Bemba	–7.745	–7.771*		–7.871	–7.891*	
	(5.09)	(4.26)		(4.85)	(4.06)	
Tonga	–6.630	–6.629		–7.047	–6.999	
	(7.01)	(4.79)		(6.97)	(4.77)	
North-Western	21.383***	21.088***		21.288***	20.990***	
	(5.71)	(4.27)		(5.48)	(4.18)	
Nyanja	–2.326	–2.209		–2.655	–2.592	
	(8.65)	(5.78)		(8.59)	(5.68)	
Constant	39.875***	39.659***	58.330***	44.504***	45.022***	66.711***
	(9.00)	(8.43)	(9.17)	(9.80)	(9.11)	(11.18)
N	443	443	443	445	445	445

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.7: Vote lead and infrastructure provision: all constituencies (panel)

	Parliamentary			Presidential		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
lead MMD	.046	.047	.048	–.122	–.118	–.105
	(.08)	(.08)	(.09)	(.09)	(.08)	(.09)
lead 2006	.025	.027	.030	.171	.171	.147
	(.12)	(.11)	(.13)	(.11)	(.11)	(.11)
lead 2010	.061	.060	.031	.174*	.172*	.118
	(.11)	(.10)	(.13)	(.10)	(.10)	(.11)
2006	–16.322*	–16.174*	–19.631**	–25.927***	–25.472***	–29.176***
	(8.51)	(8.30)	(8.22)	(9.28)	(9.18)	(9.61)
2010	–15.106**	–14.905**	–15.395**	–24.614***	–24.172***	–24.592***
	(7.50)	(7.22)	(7.51)	(8.42)	(8.18)	(8.89)
access trans	–.269	–.258*	–.012	–.255	–.247*	.034
	(.17)	(.14)	(.18)	(.17)	(.14)	(.17)
access health	.555*	.543*	1.037***	.511	.505	.874**
	(.30)	(.29)	(.35)	(.32)	(.31)	(.38)
access edu	–.729	–.713	–.206	–.646	–.640	.133
	(.72)	(.68)	(.89)	(.73)	(.69)	(.88)
Municipal	–2.556	–2.530		–2.814	–2.845	
	(3.14)	(2.47)		(3.08)	(2.38)	
City	–3.560	–3.510		–3.781	–3.778	
	(12.54)	(5.24)		(12.15)	(4.99)	
poverty	.299***	.299***	.336***	.342***	.338***	.397***
	(.09)	(.08)	(.09)	(.09)	(.08)	(.09)
pop density	–.000	–.000	–.003	.000	.000	–.003
	(.03)	(.00)	(.00)	(.03)	(.00)	(.00)
sqrt pop	–1.200***	–1.218***	–2.090**	–1.180***	–1.203***	–2.159**
	(.46)	(.45)	(.93)	(.44)	(.43)	(.93)
Provinces						
Central	18.145***	17.783***		22.966***	22.218***	
	(6.69)	(5.37)		(6.83)	(5.87)	
Copperbelt	22.118***	21.713***		28.042***	27.266***	
	(7.98)	(6.96)		(8.02)	(7.10)	
Eastern	31.125***	30.695***		34.815***	34.077***	
	(9.34)	(5.80)		(9.14)	(5.82)	
Luapula	34.425***	34.003***		37.738***	37.136***	
	(6.75)	(6.15)		(6.76)	(6.18)	
Lusaka	31.820***	31.398***		36.101***	35.310***	
	(11.04)	(7.68)		(10.73)	(7.53)	
Northern	27.809***	27.398***		32.000***	31.238***	
	(5.26)	(4.40)		(5.87)	(5.29)	
North-Western	–1.401	–1.587		–1.475	–1.635	
	(5.61)	(4.56)		(4.65)	(3.88)	
Southern	25.004***	24.766***		28.880***	28.341***	
	(7.71)	(5.29)		(7.83)	(5.63)	
Language Groups (≥ 30 %)						
Bemba	–7.772	–7.802*		–7.663	–7.698*	
	(4.92)	(4.07)		(4.95)	(4.16)	
Tonga	–6.110	–6.081		–6.905	–6.841	
	(7.14)	(4.84)		(6.91)	(4.84)	
North-Western	19.702***	19.699***		21.514***	21.172***	
	(5.88)	(4.54)		(5.46)	(4.22)	
Nyanja	–2.694	–2.641		–2.712	–2.657	
	(9.02)	(6.02)		(8.61)	(5.69)	
Constant	37.540***	37.924***	57.570***	40.372***	41.056***	63.147***
	(4.76)	(3.94)	(4.74)	(5.38)	(4.54)	(5.67)
N	441	441	441	445	445	445

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.8: Vote shares and infrastructure provision: cross-section, any project

	Parliamentary Elections			Presidential Elections		
	1998	2006	2010	1998	2006	2010
votes MMD	–.028	.168*	.212	–.027	.271*	.296**
	(.14)	(.10)	(.13)	(.16)	(.15)	(.13)
city	–3.546	–23.403***	7.426	–4.372	–21.016**	8.917
	(15.08)	(8.62)	(7.17)	(14.10)	(8.98)	(6.30)
municipal	5.874	–12.122***	–5.366	4.577	–11.516***	–5.649
	(5.06)	(4.30)	(3.89)	(5.35)	(4.35)	(3.74)
access transport	–2.085**	–.132	–.485	–2.196***	–.138	–.504
	(.83)	(.14)	(.48)	(.77)	(.15)	(.49)
access health	–.320	–.028	–.013	–4.050	–.070	–.008
	(7.37)	(.28)	(.79)	(8.60)	(.28)	(.71)
access education	.461	.147	–.550	.483	.169	–.270
	(1.41)	(.86)	(1.12)	(1.36)	(.85)	(1.11)
sqrt pop	.908	–1.057*	–.040	1.587	–1.065*	–.040
	(2.04)	(.61)	(.03)	(1.20)	(.62)	(.03)
pop density	.004	.001	–.002	.003	.000	–.002
	(.01)	(.00)	(.00)	(.01)	(.00)	(.00)
poverty	–7.121	.243**	.206*	–6.879	.234**	.157
	(16.76)	(.11)	(.12)	(17.03)	(.11)	(.12)
Provinces						
Central	–12.499	44.900***	20.772**	–16.394	44.266***	21.798**
	(10.80)	(12.96)	(10.26)	(12.80)	(12.68)	(9.85)
Copperbelt	–.682	42.494***	18.441	–3.998	39.875***	20.285*
	(9.59)	(9.91)	(11.92)	(10.35)	(9.70)	(11.32)
Eastern	26.938***	37.576***	32.555***	23.730**	38.838***	38.540***
	(9.33)	(5.98)	(8.63)	(10.42)	(6.39)	(9.56)
Luapula	5.467	53.651***	39.232***	4.035	51.050***	45.251***
	(9.12)	(11.22)	(9.58)	(9.75)	(10.80)	(9.70)
Lusaka	28.716*	36.800***	20.891	24.571	37.980***	24.894*
	(15.38)	(12.12)	(13.72)	(15.44)	(11.71)	(13.72)
Northern	.054	41.266***	47.685***	–2.416	39.443***	49.416***
	(5.78)	(8.17)	(7.21)	(8.24)	(7.82)	(7.11)
North-Western	6.413	–13.345	–2.486	6.669	–14.190	.528
	(5.27)	(9.18)	(19.94)	(4.96)	(9.42)	(19.26)
Southern	–1.488	50.985***	21.553*	–4.356	51.267***	26.435**
	(12.35)	(12.61)	(11.15)	(13.91)	(12.09)	(11.25)
Language Groups (≥ 30 %)						
Bemba	10.310*	–21.467***	–8.317	12.204**	–22.238***	–6.871
	(5.76)	(8.01)	(7.35)	(5.80)	(7.82)	(7.43)
Tonga	13.266	–29.499**	2.463	14.689	–28.700**	6.362
	(10.27)	(11.67)	(10.58)	(10.04)	(11.11)	(10.53)
North-Western	5.131	37.634***	20.444	5.006	37.792***	17.750
	(4.42)	(9.25)	(20.89)	(5.13)	(9.58)	(20.47)
Nyanja	–12.667	3.965	1.395	–10.739	3.824	.420
	(10.56)	(4.58)	(6.06)	(9.70)	(4.70)	(6.44)
Constant	43.439**	17.812	20.675	36.548**	16.040	13.843
	(16.82)	(11.32)	(12.49)	(17.42)	(11.72)	(14.10)
N	146	149	148	146	149	150

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%
Clustered standard errors in parentheses

Table D.9: Vote lead and infrastructure provision: cross-section, any project

	Parliamentary Elections			Presidential Elections		
	1998	2006	2010	1998	2006	2010
lead MMD	.097	.106	.189***	–.072	.155*	.155**
	(.06)	(.08)	(.07)	(.09)	(.08)	(.06)
city	1.236	–24.243***	8.592	–5.136	–22.054**	8.725
	(14.66)	(8.65)	(6.84)	(14.19)	(8.72)	(6.25)
municipal	6.736	–12.281***	–4.707	4.029	–11.837***	–5.722
	(5.11)	(4.35)	(3.82)	(5.50)	(4.30)	(3.72)
access transport	–2.593***	–.139	–.460	–2.162***	–.146	–.484
	(.86)	(.15)	(.45)	(.77)	(.14)	(.49)
access health	–3.277	–.015	–.077	–3.722	–.066	.004
	(8.23)	(.28)	(.71)	(8.58)	(.28)	(.70)
access education	.332	.205	–.623	.446	.223	–.280
	(1.50)	(.85)	(1.07)	(1.36)	(.86)	(1.10)
sqrt pop	.335	–1.087*	–.046*	1.527	–1.134*	–.041
	(1.95)	(.63)	(.03)	(1.17)	(.63)	(.03)
pop density	.003	.002	–.002	.003	.001	–.002
	(.01)	(.00)	(.00)	(.01)	(.00)	(.00)
poverty	2.249	.241**	.180	–7.626	.233**	.155
	(16.64)	(.11)	(.12)	(17.01)	(.11)	(.12)
Provinces						
Central	–17.355	43.315***	17.996*	–14.022	41.918***	20.699**
	(11.69)	(12.85)	(10.27)	(12.49)	(12.59)	(10.00)
Copperbelt	–8.089	40.662***	17.287	–.985	37.696***	20.256*
	(10.07)	(10.16)	(11.96)	(10.14)	(10.00)	(11.44)
Eastern	18.310*	36.635***	34.590***	26.311***	35.721***	38.113***
	(10.55)	(5.70)	(7.99)	(9.86)	(5.96)	(9.46)
Luapula	6.002	52.453***	39.416***	6.726	49.887***	45.467***
	(9.45)	(11.56)	(9.66)	(9.48)	(10.99)	(9.86)
Lusaka	23.155	35.267***	21.206	26.617*	34.188***	23.945*
	(17.01)	(11.73)	(13.25)	(15.04)	(11.25)	(13.78)
Northern	–6.750	39.337***	47.578***	.290	36.799***	49.164***
	(6.95)	(8.19)	(7.23)	(7.84)	(8.07)	(7.24)
North-Western	8.687*	–11.702	–4.639	5.123	–11.384	1.620
	(4.94)	(8.96)	(20.58)	(5.24)	(8.71)	(18.78)
Southern	–7.079	51.092***	22.563**	–1.939	51.617***	26.158**
	(12.92)	(12.44)	(11.21)	(13.59)	(12.06)	(11.28)
Language Groups (≥ 30 %)						
Bemba	9.254*	–22.190***	–6.464	13.093**	–23.252***	–6.162
	(5.47)	(8.06)	(7.31)	(6.07)	(7.95)	(7.59)
Tonga	12.168	–28.631**	6.777	14.671	–27.614**	8.029
	(10.38)	(11.61)	(10.63)	(10.08)	(11.00)	(10.92)
North-Western	–1.085	35.637***	22.824	6.778	34.821***	17.249
	(5.45)	(9.01)	(21.50)	(5.74)	(8.95)	(20.01)
Nyanja	–11.689	2.808	–.873	–11.163	3.540	–.210
	(11.34)	(4.77)	(5.65)	(9.55)	(4.73)	(6.43)
Constant	41.525***	24.734**	30.786**	37.008**	28.136**	27.163**
	(14.91)	(11.10)	(12.53)	(15.37)	(11.47)	(12.55)
N	144	149	148	146	149	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.10: Presidential lead and infrastructure improvement or construction (cross-sections)

	1998		2006		2010	
	impr	built	impr	built	impr	built
lead MMD	–.008	–.183***	.106	.236***	.054	.224***
	(.11)	(.07)	(.09)	(.08)	(.06)	(.05)
city	–1.372	–13.168	–19.950**	–3.848	6.240	5.056
	(16.41)	(9.17)	(8.11)	(6.03)	(6.33)	(5.16)
municipal	6.769	–10.118***	–10.719***	–1.527	–5.426*	–6.389**
	(6.20)	(3.59)	(3.59)	(3.98)	(3.22)	(2.90)
access transport	–2.177**	–1.022***	–.122	.046	–.590*	–.182
	(.91)	(.39)	(.17)	(.10)	(.35)	(.54)
access health	6.695	–2.201	.016	–.669**	–.163	–.509
	(8.46)	(8.19)	(.27)	(.27)	(.62)	(.49)
access education	.881	–.254	–.825	1.220*	.570	–.629
	(1.34)	(1.05)	(.74)	(.70)	(.90)	(1.28)
sqrt pop	1.449	2.721**	–1.357**	.659	–.032	–.009
	(2.09)	(1.20)	(.56)	(.62)	(.02)	(.02)
pop density	.005	–.000	–.001	–.003	–.004	.000
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	–.989	–17.617	.244**	.061	.156	.068
	(18.09)	(10.69)	(.12)	(.08)	(.11)	(.11)
Provinces						
Central	–20.786**	12.025	40.528***	15.086	31.198***	–7.073
	(10.34)	(8.99)	(11.88)	(11.11)	(11.08)	(9.76)
Copperbelt	–8.566	22.470**	32.820***	15.572	26.592**	–1.349
	(9.59)	(11.10)	(9.25)	(11.31)	(11.89)	(10.77)
Eastern	18.859*	30.327***	33.581***	4.649	37.079***	33.748***
	(9.62)	(5.92)	(6.42)	(7.41)	(12.76)	(8.68)
Luapula	–5.456	21.041**	42.170***	20.460	48.179***	14.867
	(9.22)	(9.43)	(12.09)	(12.47)	(11.33)	(10.40)
Lusaka	22.984	41.700***	34.732***	11.455	29.737*	24.251**
	(14.76)	(8.50)	(11.90)	(9.46)	(16.35)	(11.52)
Northern	–4.340	14.768*	30.160***	23.770**	49.811***	23.648***
	(7.07)	(8.18)	(6.85)	(11.04)	(9.87)	(8.32)
North-Western	–1.519	9.589**	–11.808	7.432	17.336**	–8.633
	(7.71)	(4.04)	(7.23)	(8.35)	(7.73)	(24.68)
Southern	–7.088	10.393	48.880***	21.492**	26.304**	10.423
	(11.94)	(10.18)	(11.25)	(10.41)	(12.35)	(9.78)
Language Groups (≥ 30 %)						
Bemba	16.314***	2.382	–18.270***	–25.120***	–11.401	16.726**
	(6.12)	(6.16)	(6.14)	(9.48)	(7.04)	(8.06)
Tonga	12.900	6.797	–27.254***	–11.209	1.165	24.865**
	(9.17)	(7.70)	(10.07)	(9.78)	(10.72)	(10.02)
North-Western	7.581	10.275**	35.243***	–5.484	3.727	24.397
	(5.68)	(4.67)	(7.39)	(9.78)	(11.48)	(25.40)
Nyanja	–10.787	–19.445***	3.317	4.265	.141	–9.624*
	(9.75)	(6.04)	(4.78)	(4.91)	(8.52)	(5.44)
Constant	29.084*	16.156	25.106**	11.886	17.056	4.806
	(16.28)	(10.37)	(12.42)	(9.67)	(13.78)	(11.51)
N	146	146	149	149	150	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.11: Parliamentary vote share and infrastructure improvement or construction (cross-sections)

	1998		2006		2010	
	impr	built	impr	built	impr	built
votes MMD	–.002	–.104	.063	.294**	.116	.313***
	(.14)	(.08)	(.11)	(.13)	(.12)	(.12)
city	–1.286	–12.334	–21.640***	–5.251	6.421	2.419
	(16.82)	(9.03)	(7.92)	(6.05)	(6.52)	(5.83)
municipal	6.842	–8.867**	–11.227***	–1.647	–5.125	–5.992*
	(6.22)	(3.48)	(3.57)	(4.03)	(3.27)	(3.16)
access transport	–2.181**	–1.110***	–.117	.070	–.587*	–.151
	(.91)	(.41)	(.17)	(.10)	(.33)	(.57)
access health	6.668	–2.886	.062	–.619**	–.153	–.667
	(8.36)	(8.16)	(.27)	(.28)	(.67)	(.54)
access education	.885	–.201	–.895	1.111	.394	–.740
	(1.33)	(1.10)	(.73)	(.69)	(.91)	(1.30)
poverty	–.876	–15.231	.257**	.073	.168	.112
	(18.00)	(10.80)	(.12)	(.08)	(.11)	(.12)
sqrt pop	.046	.087**	–.041**	.024	–.032	–.005
	(.07)	(.04)	(.02)	(.02)	(.02)	(.02)
pop density	.005	–.001	–.001	–.003	–.004	–.000
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces						
Central	–21.098**	5.111	42.819***	19.223*	29.992**	–5.729
	(9.83)	(7.35)	(11.99)	(11.57)	(11.76)	(11.19)
Copperbelt	–8.939	15.496*	36.965***	21.973*	25.019**	–3.160
	(9.69)	(9.00)	(8.50)	(11.55)	(12.61)	(12.08)
Eastern	18.532**	24.176***	34.390***	7.915	35.870***	26.295***
	(8.89)	(5.06)	(6.29)	(7.29)	(11.50)	(8.04)
Luapula	–5.815	13.831*	45.757***	25.204**	45.633***	7.484
	(8.42)	(7.93)	(11.29)	(12.60)	(11.03)	(10.93)
Lusaka	22.715	36.405***	36.287***	15.685	28.597*	19.722
	(14.58)	(8.18)	(12.42)	(10.12)	(15.92)	(12.19)
Northern	–4.700	7.196	33.628***	30.106***	49.333***	21.125**
	(5.99)	(6.09)	(6.36)	(11.41)	(9.68)	(8.73)
North-Western	–1.353	12.981**	–12.785*	4.268	15.834*	–14.145
	(7.42)	(5.51)	(7.56)	(8.85)	(8.29)	(26.28)
Southern	–7.407	3.513	48.400***	20.436*	24.897**	4.703
	(11.71)	(8.76)	(11.58)	(11.33)	(12.03)	(10.44)
Language Groups ($\geq$ 30 %)						
Bemba	16.180***	–.666	–17.047***	–22.131**	–11.044	12.082
	(5.34)	(5.61)	(6.16)	(9.68)	(7.07)	(8.00)
Tonga	12.902	6.917	–29.107***	–13.455	.436	16.156
	(9.16)	(7.47)	(10.42)	(10.66)	(10.14)	(9.94)
North-Western	7.357	5.115	36.959***	–.962	5.379	28.919
	(4.84)	(5.01)	(7.51)	(9.78)	(11.59)	(26.72)
Nyanja	–10.734	–18.879***	3.468	4.968	.664	–7.663
	(9.87)	(6.32)	(4.53)	(4.85)	(8.14)	(4.93)
Constant	28.980	17.848	19.132	–4.723	13.050	–3.505
	(18.46)	(11.47)	(12.28)	(8.99)	(13.31)	(11.31)
N	146	146	149	149	148	148

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.12: Parliamentary lead and infrastructure improvement or construction (cross-sections)

	1998		2006		2010	
	impr	built	impr	built	impr	built
lead MMD	.120*	–.043	.034	.258***	.109*	.221***
	(.06)	(.05)	(.09)	(.08)	(.06)	(.06)
city	3.683	–11.346	–22.039***	–5.726	7.176	2.890
	(16.41)	(9.16)	(7.90)	(5.69)	(6.32)	(5.35)
municipal	7.834	–8.788**	–11.331***	–1.467	–4.708	–5.671*
	(6.21)	(3.53)	(3.63)	(3.84)	(3.22)	(3.03)
access transport	–2.645***	–1.268***	–.120	.066	–.571*	–.134
	(.93)	(.44)	(.17)	(.10)	(.33)	(.54)
access health	3.884	–3.718	.070	–.649**	–.193	–.705
	(8.91)	(8.23)	(.27)	(.29)	(.62)	(.50)
access education	.776	–.227	–.880	1.313*	.351	–.839
	(1.42)	(1.11)	(.71)	(.73)	(.88)	(1.27)
sqrt pop	.031	.080**	–.042**	.022	–.035	–.011
	(.06)	(.04)	(.02)	(.02)	(.02)	(.02)
pop density	.004	–.001	–.001	–.003	–.003	.000
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	7.873	–12.374	.257**	.055	.152	.096
	(17.83)	(11.11)	(.12)	(.08)	(.11)	(.12)
Provinces						
Central	–25.819**	3.737	42.351***	15.233	28.240**	–7.453
	(10.56)	(7.67)	(12.09)	(11.05)	(11.57)	(11.06)
Copperbelt	–16.693*	14.015	36.520***	16.087	24.223*	–3.141
	(9.90)	(9.50)	(9.10)	(11.03)	(12.36)	(11.92)
Eastern	9.672	21.740***	34.010***	6.506	37.162***	27.428***
	(9.74)	(5.58)	(6.11)	(7.49)	(11.03)	(7.58)
Luapula	–6.022	14.424*	45.542***	20.494*	45.717***	7.894
	(8.08)	(8.33)	(11.60)	(11.78)	(11.03)	(10.87)
Lusaka	16.788	34.770***	35.754***	12.369	28.766*	20.174*
	(15.84)	(8.55)	(12.37)	(9.56)	(15.56)	(11.83)
Northern	–11.453*	5.371	33.077***	24.809**	49.253***	21.166**
	(6.73)	(6.54)	(6.92)	(10.80)	(9.65)	(8.66)
North-Western	1.216	12.818**	–12.196	7.255	14.520*	–15.811
	(7.12)	(5.61)	(7.46)	(8.54)	(8.56)	(27.06)
Southern	–13.237	2.487	48.426***	21.066**	25.518**	5.464
	(12.08)	(9.11)	(11.53)	(10.62)	(12.08)	(10.28)
Language Groups (≥ 30 %)						
Bemba	15.058***	–.690	–17.279***	–24.362**	–9.851	12.962
	(5.07)	(5.55)	(6.23)	(9.40)	(6.81)	(7.99)
Tonga	11.942	6.702	–28.923***	–10.440	3.084	19.556*
	(9.22)	(7.45)	(10.58)	(9.82)	(10.07)	(9.98)
North-Western	1.214	3.706	36.282***	–5.406	6.806	31.042
	(5.69)	(5.69)	(7.47)	(9.97)	(11.87)	(27.46)
Nyanja	–9.426	–18.335***	3.072	2.547	–.664	–10.094**
	(10.32)	(6.17)	(4.69)	(4.95)	(7.80)	(4.79)
Constant	27.820*	13.850	21.541*	9.835	18.671	10.656
	(15.97)	(10.64)	(11.57)	(9.40)	(13.43)	(12.69)
N	144	144	149	149	148	148

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.13: Presidential vote share and infrastructure improvement and construction (panel)

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
votes MMD	–.078	–.069	–.077	–.145	–.118	–.119
	(.16)	(.16)	(.16)	(.12)	(.11)	(.12)
votes 2006	.114	.114	.101	.276*	.258*	.211
	(.22)	(.22)	(.21)	(.16)	(.13)	(.14)
votes 2010	.022	.021	–.065	.305*	.282*	.233
	(.19)	(.19)	(.20)	(.17)	(.14)	(.16)
2006	–23.333	–22.902	–25.325*	–25.839**	–24.162**	–26.738**
	(14.24)	(14.14)	(14.71)	(11.64)	(9.78)	(11.20)
2010	–21.161	–20.708	–16.541	–22.451*	–20.680**	–20.439*
	(14.26)	(13.69)	(15.00)	(11.48)	(9.63)	(11.43)
access trans	–.309*	–.294**	–.061	.044	.007	.108
	(.16)	(.14)	(.15)	(.23)	(.18)	(.21)
access health	.503*	.493*	.908**	–.190	–.131	.090
	(.30)	(.29)	(.35)	(.25)	(.20)	(.23)
access edu	–.800	–.812	.090	–.230	–.148	.470
	(.66)	(.62)	(.77)	(.66)	(.55)	(.64)
Municipal	–1.760	–1.886		–4.595	–3.630	
	(3.26)	(2.45)		(3.00)	(2.28)	
City	–2.433	–2.466		–2.872	–1.598	
	(12.34)	(5.66)		(8.67)	(3.13)	
poverty	.324***	.320***	.352***	.184**	.177***	.246***
	(.09)	(.08)	(.09)	(.08)	(.07)	(.08)
pop density	–.001	–.001	–.005**	–.001	–.001	–.002
	(.03)	(.00)	(.00)	(.02)	(.00)	(.00)
sqrt pop	–.037**	–.038**	–.065**	.019	.015	–.009
	(.02)	(.02)	(.03)	(.01)	(.01)	(.02)
Provinces						
Central	21.722***	20.751***		10.317	7.816	
	(7.09)	(5.76)		(8.04)	(6.22)	
Copperbelt	23.494***	22.493***		17.811**	14.396**	
	(7.92)	(6.76)		(8.40)	(6.58)	
Eastern	30.684***	29.163***		19.712***	17.542***	
	(8.40)	(5.36)		(6.85)	(4.28)	
Luapula	31.573***	30.677***		19.460**	17.561***	
	(7.13)	(6.14)		(7.89)	(6.58)	
Lusaka	34.947***	33.179***		29.420***	26.585***	
	(9.60)	(6.73)		(8.24)	(5.35)	
Northern	27.156***	26.112***		21.177***	18.434***	
	(5.99)	(5.02)		(7.57)	(6.24)	
North-Western	1.806	1.540		4.010	2.319	
	(3.99)	(3.46)		(9.03)	(7.54)	
Southern	24.660***	23.808***		13.038	10.963*	
	(8.85)	(6.12)		(10.04)	(6.33)	
Language Groups (≥ 30 %)						
Bemba	–6.091	–6.156*		–4.286	–4.260	
	(4.20)	(3.45)		(5.83)	(4.94)	
Tonga	–8.292	–7.992		.937	.839	
	(7.32)	(4.87)		(8.73)	(5.72)	
North-Western	16.855***	16.307***		10.160	9.401	
	(5.25)	(4.17)		(9.60)	(7.96)	
Nyanja	–2.258	–1.543		–6.596	–6.501**	
	(6.52)	(3.72)		(4.45)	(2.78)	
Constant	35.022***	35.770***	55.781***	11.846*	13.708**	25.132***
	(10.50)	(10.05)	(10.67)	(6.96)	(6.48)	(8.54)
N	445	445	445	445	445	445

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.14: Presidential vote lead and infrastructure improvement and construction (panel)

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
lead MMD	–.071	–.065	–.062	–.114	–.095	–.091
	(.09)	(.09)	(.09)	(.07)	(.06)	(.07)
lead 2006	.070	.070	.051	.158*	.147**	.127*
	(.11)	(.11)	(.11)	(.08)	(.07)	(.07)
lead 2010	.044	.042	–.001	.197**	.179**	.151*
	(.10)	(.10)	(.11)	(.10)	(.08)	(.09)
2006	–20.928**	–20.458**	–22.853***	–17.911**	–16.695**	–20.329**
	(9.24)	(8.98)	(8.51)	(8.06)	(7.05)	(7.88)
2010	–22.301***	–21.777***	–21.192***	–11.632	–10.435	–11.946
	(8.52)	(8.16)	(7.89)	(7.20)	(6.35)	(7.32)
access trans	–.309*	–.294**	–.065	.042	.005	.105
	(.16)	(.14)	(.15)	(.23)	(.18)	(.21)
access health	.509*	.499*	.921**	–.175	–.115	.100
	(.31)	(.29)	(.35)	(.25)	(.20)	(.22)
access edu	–.802	–.813	.090	–.215	–.131	.509
	(.67)	(.62)	(.77)	(.66)	(.55)	(.64)
Municipal	–1.896	–2.017		–4.811	–3.828*	
	(3.23)	(2.43)		(3.01)	(2.28)	
City	–2.749	–2.776		–3.334	–2.043	
	(12.08)	(5.45)		(8.73)	(3.09)	
poverty	.329***	.325***	.354***	.190***	.183***	.249***
	(.09)	(.08)	(.09)	(.07)	(.07)	(.07)
pop density	–.001	–.001	–.004*	–.001	–.001	–.002
	(.03)	(.00)	(.00)	(.02)	(.00)	(.00)
sqrt pop	–.037**	–.038**	–.065**	.018	.013	–.011
	(.02)	(.02)	(.03)	(.01)	(.01)	(.02)
Provinces						
Central	22.247***	21.218***		10.477	7.863	
	(7.16)	(5.90)		(8.05)	(6.26)	
Copperbelt	24.301***	23.237***		18.584**	15.009**	
	(8.03)	(6.87)		(8.44)	(6.65)	
Eastern	30.992***	29.421***		19.573***	17.293***	
	(8.20)	(5.21)		(6.82)	(4.21)	
Luapula	32.262***	31.320***		20.236**	18.196***	
	(7.20)	(6.24)		(7.95)	(6.65)	
Lusaka	35.148***	33.327***		29.070***	26.137***	
	(9.39)	(6.68)		(8.13)	(5.23)	
Northern	27.717***	26.613***		21.519***	18.637***	
	(6.11)	(5.14)		(7.63)	(6.29)	
North-Western	1.379	1.194		3.855	2.332	
	(3.98)	(3.53)		(8.82)	(7.36)	
Southern	25.076***	24.218***		13.467	11.327*	
	(8.75)	(6.10)		(9.91)	(6.30)	
Language Groups (≥ 30 %)						
Bemba	–5.928	–6.012*		–4.060	–4.078	
	(4.28)	(3.50)		(5.96)	(5.08)	
Tonga	–8.478	–8.148*		1.153	1.070	
	(7.34)	(4.94)		(8.62)	(5.74)	
North-Western	17.265***	16.647***		10.343	9.436	
	(5.30)	(4.29)		(9.47)	(7.85)	
Nyanja	–2.214	–1.514		–6.700	–6.611**	
	(6.53)	(3.75)		(4.48)	(2.78)	
Constant	32.942***	34.022***	53.542***	7.658*	10.450***	21.763***
	(6.30)	(5.35)	(5.22)	(4.38)	(3.88)	(4.56)
N	445	445	445	445	445	445

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.15: Parliamentary vote share and infrastructure improvement and construction (panel)

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
votes MMD	–.057	–.034	.008	–.096	–.064	–.048
	(.15)	(.15)	(.15)	(.10)	(.08)	(.09)
votes 2006	.116	.101	.081	.242	.216	.194
	(.23)	(.22)	(.23)	(.16)	(.14)	(.16)
votes 2010	.095	.077	.000	.231	.201	.140
	(.21)	(.18)	(.20)	(.15)	(.13)	(.14)
2006	–20.653*	–19.499*	–19.010	–22.185**	–20.579***	–22.654**
	(11.73)	(11.79)	(13.20)	(9.64)	(7.85)	(9.23)
2010	–22.019*	–20.721*	–15.583	–16.494**	–14.694**	–13.164
	(11.91)	(10.94)	(12.59)	(8.25)	(6.96)	(8.60)
access trans	–.324*	–.307**	–.112	.065	.031	.125
	(.18)	(.14)	(.16)	(.24)	(.19)	(.22)
access health	.553*	.539*	1.047***	–.231	–.179	.062
	(.34)	(.29)	(.34)	(.25)	(.21)	(.24)
access edu	–.844	–.850	–.102	–.232	–.148	.422
	(.71)	(.61)	(.79)	(.66)	(.55)	(.63)
Municipal	–1.716	–1.812		–4.463	–3.454	
	(3.10)	(2.52)		(3.04)	(2.30)	
City	–2.330	–2.294		–3.299	–1.897	
	(13.71)	(5.72)		(9.09)	(3.07)	
poverty	.304***	.300***	.307***	.188**	.184***	.239***
	(.08)	(.08)	(.09)	(.08)	(.07)	(.07)
pop density	–.001	–.001	–.004*	–.001	–.002	–.003
	(.04)	(.00)	(.00)	(.02)	(.00)	(.00)
sqrt pop	–.037**	–.038**	–.063**	.021	.016	–.006
	(.02)	(.02)	(.03)	(.01)	(.01)	(.02)
Provinces						
Central	20.119***	19.185***		9.165	6.814	
	(7.29)	(5.74)		(8.04)	(6.25)	
Copperbelt	22.328***	21.218***		16.653**	13.252**	
	(8.42)	(6.94)		(8.22)	(6.56)	
Eastern	31.240***	29.565***		18.049***	15.812***	
	(7.94)	(5.07)		(6.49)	(4.03)	
Luapula	30.883***	29.916***		17.527**	15.686**	
	(7.29)	(5.86)		(7.72)	(6.49)	
Lusaka	34.482***	32.620***		27.860***	25.032***	
	(9.30)	(6.54)		(8.21)	(5.37)	
Northern	26.685***	25.616***		19.860***	17.227***	
	(5.98)	(4.67)		(7.30)	(6.08)	
North-Western	1.717	1.493		3.516	1.868	
	(4.43)	(3.61)		(9.23)	(7.68)	
Southern	24.452***	23.560***		11.296	9.300	
	(8.93)	(5.87)		(9.99)	(6.30)	
Language Groups (≥ 30 %)						
Bemba	–5.363	–5.417		–4.961	–4.867	
	(4.54)	(3.59)		(6.08)	(5.06)	
Tonga	–7.084	–6.834		.458	.321	
	(8.10)	(4.87)		(8.96)	(5.86)	
North-Western	16.820***	16.295***		10.345	9.628	
	(5.01)	(3.90)		(9.76)	(8.13)	
Nyanja	–2.347	–1.565		–6.219	–6.068**	
	(6.19)	(3.79)		(4.44)	(2.79)	
Constant	33.115***	33.143***	50.237***	8.999	10.734*	19.880***
	(9.15)	(8.76)	(8.66)	(6.30)	(5.57)	(5.77)
N	443	443	443	443	443	443

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.16: Parliamentary lead and infrastructure improvement and construction (panel)

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
lead MMD	.061	.064	.056	–.036	–.031	–.038
	(.08)	(.08)	(.08)	(.06)	(.06)	(.06)
lead 2006	–.056	–.053	–.044	.115	.115	.108
	(.11)	(.11)	(.12)	(.09)	(.08)	(.08)
lead 2010	–.013	–.013	–.024	.134	.125*	.091
	(.10)	(.10)	(.11)	(.08)	(.08)	(.08)
2006	–12.344	–12.211	–14.240*	–12.558*	–12.631**	–16.637**
	(8.14)	(7.84)	(7.63)	(6.98)	(6.05)	(6.63)
2010	–14.364**	–14.107**	–13.502**	–6.130	–6.051	–7.956
	(7.12)	(6.73)	(6.68)	(6.34)	(5.54)	(6.42)
access trans	–.344**	–.325**	–.123	.058	.027	.116
	(.17)	(.14)	(.16)	(.24)	(.19)	(.22)
access health	.589**	.573**	1.122***	–.202	–.152	.096
	(.29)	(.28)	(.33)	(.25)	(.21)	(.24)
access edu	–.880	–.880	–.169	–.238	–.150	.422
	(.67)	(.62)	(.79)	(.66)	(.55)	(.64)
Municipal	–1.824	–1.874		–4.569	–3.544	
	(3.34)	(2.53)		(3.01)	(2.31)	
City	–2.238	–2.208		–3.622	–2.282	
	(12.64)	(5.53)		(9.00)	(3.02)	
poverty	.277***	.276***	.286***	.175**	.175***	.235***
	(.09)	(.08)	(.09)	(.07)	(.06)	(.07)
pop density	–.001	–.001	–.003*	–.001	–.001	–.003
	(.04)	(.00)	(.00)	(.02)	(.00)	(.00)
sqrt pop	–.038**	–.039**	–.064**	.018	.013	–.008
	(.02)	(.02)	(.03)	(.01)	(.01)	(.02)
Provinces						
Central	18.116**	17.521***		7.873	5.959	
	(7.09)	(5.61)		(8.10)	(6.29)	
Copperbelt	19.544**	18.887***		15.488*	12.646*	
	(8.05)	(6.79)		(8.38)	(6.69)	
Eastern	28.956***	27.752***		16.992**	15.224***	
	(8.04)	(4.77)		(6.91)	(4.34)	
Luapula	30.789***	30.059***		17.345**	15.741**	
	(6.98)	(6.05)		(7.81)	(6.56)	
Lusaka	31.919***	30.532***		26.531***	24.212***	
	(9.26)	(6.43)		(8.50)	(5.49)	
Northern	24.730***	24.030***		18.659**	16.442***	
	(5.53)	(4.40)		(7.44)	(6.17)	
North-Western	1.985	1.770		3.623	2.040	
	(4.29)	(3.61)		(9.38)	(7.72)	
Southern	22.758***	22.239***		10.942	9.315	
	(8.47)	(5.78)		(9.98)	(6.31)	
Language Groups (≥ 30 %)						
Bemba	–5.266	–5.333		–5.011	–4.957	
	(4.36)	(3.50)		(5.97)	(5.03)	
Tonga	–6.928	–6.640		1.037	.866	
	(7.46)	(4.99)		(8.76)	(5.74)	
North-Western	15.513***	15.292***		9.632	9.189	
	(4.72)	(3.59)		(10.01)	(8.28)	
Nyanja	–2.271	–1.602		–6.681	–6.591**	
	(6.86)	(3.96)		(4.60)	(2.89)	
Constant	30.567***	31.325***	49.535***	6.179	9.058**	18.635***
	(5.80)	(4.73)	(4.02)	(4.84)	(3.99)	(3.47)
N	441	441	441	441	441	441

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.17: Presidential vote share and road infrastructure provision

	1998			2006			2010		
	impr	built	any	impr	built	any	impr	built	any
votes MMD	.16	–.07	.15	.29	.07	.31	.22**	.20***	.34***
	(.19)	(.08)	(.19)	(.19)	(.08)	(.19)	(.09)	(.07)	(.11)
city	–8.89	–22.31*	–11.28	–5.12	–7.12**	–5.82	5.35	–.56	8.91
	(10.82)	(12.04)	(10.91)	(7.60)	(3.04)	(7.61)	(8.84)	(3.55)	(8.00)
municipal	.41	–2.25	–.48	–6.58	.99	–5.67	.79	–.43	2.34
	(5.86)	(2.36)	(5.91)	(4.42)	(2.08)	(4.72)	(3.12)	(2.25)	(4.10)
access	–.70	–.32	–.61	–.41**	–.16**	–.41**	–.32	–.05	–.26
	(.67)	(.33)	(.67)	(.16)	(.08)	(.17)	(.41)	(.21)	(.47)
poverty	5.86	–14.05**	3.39	.16	–.03	.15	–.06	–.04	–.08
	(16.05)	(6.80)	(16.59)	(.11)	(.05)	(.11)	(.10)	(.07)	(.11)
sqrt pop	.08	.08**	.09	–.03	.00	–.03	.02	.02*	.01
	(.05)	(.03)	(.06)	(.02)	(.01)	(.02)	(.02)	(.01)	(.02)
pop density	.01*	.00	.01**	–.00	.00	–.00	–.00	.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	7.83	–3.23	6.82	32.57***	–1.88	33.78***	24.06**	–.19	22.14*
	(10.30)	(4.52)	(10.28)	(10.23)	(5.15)	(10.61)	(9.36)	(7.00)	(11.57)
Copperbelt	4.48	3.61	3.18	21.64**	–3.35	23.99**	23.55**	5.72	25.60*
	(10.31)	(6.95)	(10.20)	(10.19)	(5.81)	(10.54)	(10.54)	(7.60)	(13.29)
Eastern	8.45	8.63**	7.96	39.38***	–3.19	41.10***	26.85***	16.96***	35.60***
	(10.39)	(3.42)	(10.38)	(7.30)	(4.74)	(7.35)	(6.96)	(5.75)	(8.55)
Luapula	2.58	–4.92	–.16	24.51*	–6.16	24.88*	42.09***	7.16	45.84***
	(9.74)	(4.66)	(9.59)	(12.95)	(5.61)	(13.35)	(11.58)	(6.77)	(13.30)
Lusaka	27.97**	15.90***	30.25**	53.90***	.68	56.44***	28.35**	19.73***	37.43***
	(13.74)	(5.27)	(13.68)	(14.32)	(5.20)	(14.50)	(12.59)	(6.98)	(13.36)
Northern	.46	–.08	–.96	19.72***	–5.96	20.31***	36.10***	12.72**	40.07***
	(8.86)	(3.69)	(8.80)	(6.68)	(5.19)	(7.10)	(9.07)	(5.91)	(11.08)
North-Western	–.44	54.41***	.41	–23.07***	–3.38	–25.19***	4.67	12.39**	12.23
	(9.48)	(13.79)	(9.58)	(7.89)	(3.67)	(7.97)	(13.56)	(6.18)	(15.27)
Southern	13.90	–.48	13.66	30.95***	–4.18	31.82***	35.80***	10.70	39.73***
	(10.92)	(4.82)	(10.81)	(11.00)	(5.08)	(11.41)	(8.93)	(6.99)	(11.03)
Language Groups ($\geq$ 30 %)									
Bemba	4.90	6.71**	5.92	–16.07**	–4.50	–16.80**	–6.46	6.03	–3.69
	(5.38)	(2.74)	(5.47)	(6.58)	(3.74)	(6.96)	(8.32)	(5.62)	(10.19)
Tonga	5.04	3.95	4.40	–25.96**	–3.74	–25.55**	–2.24	12.41*	5.00
	(7.40)	(3.43)	(7.47)	(9.96)	(3.53)	(10.31)	(9.05)	(6.67)	(10.91)
North-Western	12.36	–49.82***	10.33	39.05***	–3.38	41.54***	14.96	3.32	15.14
	(8.21)	(12.79)	(7.79)	(4.94)	(4.81)	(4.94)	(14.45)	(5.97)	(16.18)
Nyanja	–5.54	–7.63***	–6.49	–18.11**	–3.52	–19.15**	4.79	–5.27**	1.87
	(8.53)	(2.84)	(8.83)	(8.91)	(3.50)	(9.06)	(4.15)	(2.63)	(4.28)
Constant	–20.60	1.03	–17.13	.48	9.55*	.76	–18.60*	–19.58***	–25.32**
	(17.66)	(8.76)	(18.06)	(10.96)	(5.49)	(11.12)	(10.57)	(7.14)	(11.84)
N	146	146	146	149	149	149	150	150	150

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses

Table D.18: Presidential vote lead and road infrastructure provision

	1998			2006			2010		
	impr	built	any	impr	built	any	impr	built	any
lead MMD	.05	–.05	.04	.14	.04	.16	.11**	.10***	.17***
	(.10)	(.04)	(.10)	(.13)	(.05)	(.13)	(.05)	(.03)	(.06)
city	–9.54	–22.49*	–11.94	–6.93	–7.37***	–7.55	5.02	–1.00	8.38
	(10.81)	(12.15)	(10.90)	(7.24)	(2.76)	(7.12)	(8.72)	(3.51)	(7.86)
municipal	.06	–2.45	–.84	–7.19	.92	–6.24	.70	–.55	2.19
	(5.96)	(2.38)	(6.02)	(4.34)	(1.96)	(4.63)	(3.11)	(2.27)	(4.11)
access	–.70	–.31	–.60	–.41**	–.16**	–.41**	–.30	–.04	–.24
	(.68)	(.33)	(.68)	(.16)	(.08)	(.17)	(.41)	(.21)	(.47)
poverty	4.57	–14.18**	2.10	.16	–.03	.15	–.06	–.04	–.07
	(15.86)	(6.81)	(16.40)	(.11)	(.05)	(.12)	(.10)	(.07)	(.11)
sqrt pop	.08	.08**	.09	–.03	.00	–.03	.02	.02*	.01
	(.05)	(.03)	(.06)	(.02)	(.01)	(.02)	(.02)	(.01)	(.02)
pop density	.01**	.00	.01**	–.00	.00*	–.00	–.00	.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	9.85	–2.68	8.88	30.73***	–2.55	31.44***	23.58**	–.63	21.38*
	(10.27)	(4.40)	(10.21)	(11.10)	(5.25)	(11.49)	(9.53)	(7.17)	(11.83)
Copperbelt	7.09	4.30	5.85	20.52*	–4.02	22.21*	23.71**	5.86	25.85*
	(10.34)	(7.01)	(10.15)	(11.38)	(5.89)	(11.73)	(10.63)	(7.64)	(13.41)
Eastern	10.90	9.10***	10.45	35.80***	–4.05	37.18***	26.22***	16.17***	34.62***
	(10.04)	(3.40)	(9.96)	(7.25)	(4.57)	(7.22)	(6.87)	(5.65)	(8.42)
Luapula	5.43	–4.49	2.72	24.27*	–6.62	24.09*	42.13***	7.03	45.87***
	(9.50)	(4.31)	(9.23)	(13.94)	(5.68)	(14.34)	(11.77)	(6.79)	(13.54)
Lusaka	30.39**	15.99***	32.68**	49.89***	–.40	51.93***	27.60**	18.93***	36.26***
	(13.33)	(5.24)	(13.26)	(14.55)	(5.06)	(14.63)	(12.69)	(7.06)	(13.46)
Northern	3.14	.43	1.77	17.83**	–6.73	17.79**	35.93***	12.48**	39.81***
	(8.65)	(3.48)	(8.50)	(8.34)	(5.38)	(8.74)	(9.16)	(5.95)	(11.22)
North-Western	.25	53.12***	.98	–20.26**	–2.66	–22.05***	5.47	13.14**	13.48
	(10.53)	(13.96)	(10.63)	(7.91)	(3.48)	(7.92)	(13.27)	(6.12)	(14.91)
Southern	15.98	.07	15.79	31.08***	–4.09	32.01***	35.43***	10.21	39.15***
	(10.79)	(4.62)	(10.62)	(11.41)	(5.11)	(11.88)	(9.01)	(7.02)	(11.14)
Language Groups ($\geq$ 30 %)									
Bemba	5.64	6.97**	6.69	–16.83**	–4.80	–17.76**	–6.25	6.12	–3.36
	(5.38)	(2.81)	(5.50)	(6.88)	(3.79)	(7.27)	(8.58)	(5.79)	(10.58)
Tonga	4.88	4.02	4.25	–25.41**	–3.41	–24.69**	–1.50	12.94*	6.16
	(7.29)	(3.31)	(7.37)	(10.39)	(3.57)	(10.75)	(9.49)	(7.03)	(11.54)
North-Western	12.75	–48.82***	10.81	36.23***	–4.21	38.28***	14.60	2.91	14.58
	(9.30)	(12.81)	(8.89)	(5.37)	(4.84)	(5.45)	(14.13)	(5.79)	(15.71)
Nyanja	–6.48	–7.42**	–7.41	–18.15**	–3.55	–19.22**	4.41	–5.60**	1.27
	(8.33)	(2.96)	(8.65)	(9.04)	(3.53)	(9.18)	(4.17)	(2.71)	(4.31)
Constant	–13.11	–1.17	–9.94	12.10	12.69**	13.95	–8.83	–10.43	–10.03
	(13.34)	(7.01)	(13.66)	(12.45)	(5.95)	(12.70)	(8.65)	(6.51)	(9.69)
N	146	146	146	149	149	149	150	150	150

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses

Table D.19: Presidential vote share and health infrastructure provision

		1998			2006			2010	
	impr	built	any	impr	built	any	impr	built	any
votes MMD	–.30	–.04	–.28	.02	.25**	.10	.10	.16*	.20**
	(.21)	(.10)	(.21)	(.16)	(.11)	(.16)	(.08)	(.09)	(.09)
city	–8.89	–5.51	–8.18	–7.34	–1.59	–9.43	6.22	.64	7.47
	(14.29)	(5.30)	(13.23)	(7.87)	(5.64)	(8.13)	(4.97)	(4.79)	(6.50)
municipal	5.32	–3.60	4.44	–3.29	–5.55**	–7.12*	–4.16*	–3.62	–5.50*
	(6.97)	(2.65)	(6.12)	(3.46)	(2.70)	(3.70)	(2.25)	(2.77)	(3.26)
access	8.20	1.43	5.20	–.29	–.10	–.16	–.94***	–.67*	–1.26***
	(10.37)	(6.36)	(10.19)	(.24)	(.20)	(.23)	(.32)	(.35)	(.39)
poverty	13.87	–6.62	12.14	.09	–.06	.04	.04	.01	.08
	(17.49)	(7.98)	(15.70)	(.11)	(.05)	(.11)	(.08)	(.08)	(.10)
sqrt pop	.06	.07**	.07	–.02	.03**	–.01	–.01	.01	–.02
	(.05)	(.03)	(.06)	(.02)	(.01)	(.02)	(.01)	(.01)	(.02)
pop density	.01***	–.00	.01*	–.00	–.01***	–.01	–.00	.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	2.05	.62	1.57	21.71**	17.14**	26.24**	1.89	–2.15	–5.86
	(9.00)	(6.38)	(9.56)	(9.02)	(8.34)	(10.54)	(8.40)	(6.99)	(8.03)
Copperbelt	19.64*	3.17	19.64*	20.23*	17.94**	26.56**	5.30	–7.16	–7.05
	(9.94)	(6.72)	(10.25)	(10.32)	(8.45)	(10.86)	(7.70)	(7.59)	(8.43)
Eastern	30.61***	19.36***	35.87***	7.52**	4.93	6.35	29.16**	18.01	25.39**
	(11.20)	(5.80)	(12.11)	(3.33)	(5.19)	(4.44)	(11.45)	(11.28)	(11.48)
Luapula	14.34	6.10	17.10	32.62***	12.08	34.77***	9.93	1.45	2.47
	(10.43)	(8.58)	(11.17)	(9.93)	(8.15)	(10.67)	(8.55)	(9.08)	(9.09)
Lusaka	28.49**	31.52***	43.15***	17.51*	15.09**	16.21	26.82**	8.61	17.65
	(12.64)	(7.93)	(13.27)	(10.15)	(6.50)	(10.83)	(11.13)	(11.34)	(11.30)
Northern	16.90*	–.64	15.63*	20.59***	19.97***	26.25***	19.55**	7.37	14.57**
	(9.13)	(5.96)	(9.37)	(7.51)	(6.88)	(8.67)	(7.93)	(8.31)	(6.56)
North-Western	10.17*	12.42**	15.25**	17.96	–3.38	10.83	16.06***	–12.38	–5.89
	(5.27)	(5.96)	(5.98)	(10.95)	(8.09)	(12.93)	(2.66)	(10.18)	(10.33)
Southern	15.35	6.65	19.74*	27.25***	17.83*	33.60***	6.49	–2.04	–1.23
	(10.86)	(6.76)	(11.77)	(8.05)	(9.24)	(9.64)	(9.57)	(7.99)	(9.73)
Language Groups (≥ 30 %)									
Bemba	11.48**	7.31	11.90*	–15.61**	–18.48***	–22.24**	1.80	4.89	6.11
	(5.13)	(5.44)	(6.58)	(7.84)	(5.95)	(9.06)	(4.90)	(5.50)	(7.05)
Tonga	8.24	8.17	12.00	–18.74**	–13.11	–25.13***	11.44	12.25*	16.41
	(6.59)	(5.56)	(8.29)	(7.81)	(9.25)	(9.53)	(7.18)	(6.77)	(10.23)
North-Western	4.32	.81	3.04	–9.11	6.81	–3.06	–12.26	11.68	–.54
	(5.99)	(6.17)	(5.59)	(10.02)	(8.21)	(12.33)	(7.47)	(11.34)	(10.95)
Nyanja	–15.17*	–13.36**	–16.71	5.71**	4.08	10.19***	–15.82*	–8.64	–12.84
	(8.62)	(5.50)	(10.35)	(2.41)	(2.97)	(2.96)	(8.04)	(8.15)	(9.36)
Constant	–6.62	–3.87	–3.57	10.04	–2.90	15.03	4.16	–3.23	10.54
	(20.29)	(8.77)	(19.15)	(10.18)	(7.05)	(10.36)	(9.59)	(9.94)	(9.22)
N	146	146	146	149	149	149	150	150	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.20: Presidential vote lead and health infrastructure provision

		1998			2006			2010	
	impr	built	any	impr	built	any	impr	built	any
lead MMD	–.19	–.04	–.19	.01	.17***	.06	.05	.08*	.10**
	(.12)	(.05)	(.12)	(.09)	(.06)	(.10)	(.04)	(.05)	(.05)
city	–8.95	–5.83	–8.50	–7.53	–2.02	–9.79	6.00	.53	7.14
	(14.29)	(5.27)	(13.26)	(7.53)	(5.37)	(7.93)	(4.98)	(4.78)	(6.47)
municipal	5.05	–3.87	4.02	–3.35	–5.68**	–7.23**	–4.22*	–3.68	–5.60*
	(7.02)	(2.64)	(6.20)	(3.41)	(2.55)	(3.65)	(2.24)	(2.71)	(3.19)
access	8.26	1.50	5.34	–.29	–.11	–.16	–.94***	–.66*	–1.25***
	(10.36)	(6.36)	(10.19)	(.24)	(.20)	(.22)	(.32)	(.35)	(.39)
poverty	14.82	–6.93	12.67	.09	–.06	.04	.04	.01	.08
	(17.02)	(7.87)	(15.36)	(.11)	(.05)	(.11)	(.07)	(.08)	(.10)
sqrt pop	.06	.07**	.07	–.02	.03**	–.01	–.01	.01	–.02
	(.05)	(.03)	(.06)	(.02)	(.01)	(.02)	(.01)	(.01)	(.02)
pop density	.01***	–.00	.01*	–.00	–.01***	–.01	–.00	.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	2.38	1.50	2.58	21.63**	14.24*	25.24**	1.68	–2.80	–6.43
	(8.97)	(6.43)	(9.48)	(9.34)	(8.34)	(10.75)	(8.38)	(6.90)	(8.08)
Copperbelt	20.16**	4.32	21.03**	20.27*	14.63*	25.58**	5.36	–7.22	–7.01
	(9.90)	(6.74)	(10.14)	(10.92)	(8.46)	(11.44)	(7.69)	(7.57)	(8.42)
Eastern	30.60***	20.38***	36.90***	7.27**	1.74	5.06	28.70**	17.80	24.70**
	(10.92)	(5.50)	(11.79)	(3.25)	(4.92)	(4.16)	(11.50)	(11.27)	(11.49)
Luapula	14.20	7.13	17.85*	32.72***	9.57	34.13***	9.84	1.54	2.38
	(10.09)	(8.41)	(10.70)	(10.25)	(8.07)	(10.97)	(8.62)	(9.03)	(9.09)
Lusaka	27.56**	32.23***	43.22***	17.25*	11.04*	14.66	26.36**	8.11	16.84
	(12.51)	(7.67)	(12.87)	(10.30)	(6.26)	(10.75)	(11.16)	(11.32)	(11.36)
Northern	16.84*	.38	16.46*	20.54**	16.41**	25.11***	19.40**	7.22	14.30**
	(8.87)	(5.96)	(9.18)	(8.11)	(7.03)	(9.11)	(7.95)	(8.20)	(6.50)
North-Western	6.33	11.44*	11.31	18.17*	–.84	11.93	16.39***	–11.84	–5.27
	(5.84)	(6.27)	(6.90)	(10.45)	(7.56)	(12.54)	(2.72)	(9.96)	(10.09)
Southern	15.62	7.57	20.84*	27.25***	18.37**	33.73***	6.19	–2.18	–1.67
	(10.81)	(6.74)	(11.63)	(8.07)	(8.77)	(9.56)	(9.58)	(7.95)	(9.74)
Language Groups (≥ 30 %)									
Bemba	11.89**	7.75	12.59*	–15.64*	–19.83***	–22.64**	1.81	5.31	6.31
	(5.06)	(5.52)	(6.64)	(7.92)	(5.75)	(9.12)	(4.97)	(5.59)	(7.16)
Tonga	8.69	8.25	12.33	–18.76**	–11.51	–24.65**	11.64	13.17*	17.07
	(6.54)	(5.57)	(8.29)	(8.03)	(9.00)	(9.61)	(7.38)	(7.12)	(10.53)
North-Western	6.54	1.77	5.68	–9.29	3.64	–4.26	–12.43*	11.45	–.84
	(6.58)	(6.40)	(6.17)	(9.99)	(7.97)	(12.27)	(7.50)	(11.11)	(10.72)
Nyanja	–14.15*	–13.46**	–16.14	5.71**	4.02	10.15***	–15.97*	–8.99	–13.19
	(8.54)	(5.39)	(10.09)	(2.41)	(3.15)	(3.01)	(8.10)	(8.16)	(9.41)
Constant	–18.26	–4.75	–13.94	10.81	9.30	19.71*	8.83	3.85	19.52**
	(15.71)	(7.07)	(14.93)	(10.65)	(6.82)	(10.19)	(9.02)	(8.44)	(8.83)
N	146	146	146	149	149	149	150	150	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.21: Presidential vote share and education infrastructure provision

	1998			2006			2010		
	impr	built	any	impr	built	any	impr	built	any
votes MMD	–.10	–.28**	–.21	.27**	.27**	.38**	–.06	.29***	.13
	(.19)	(.12)	(.17)	(.13)	(.12)	(.15)	(.10)	(.09)	(.12)
city	–5.60	–3.44	–6.58	–5.40	–3.85	–5.92	–2.17	5.36	4.57
	(11.14)	(8.03)	(13.19)	(6.61)	(4.68)	(6.55)	(5.59)	(4.39)	(5.20)
municipal	.41	–9.55***	–1.96	–6.05	–.88	–5.17	–7.88**	–4.21	–7.62**
	(4.94)	(3.45)	(4.96)	(3.68)	(4.11)	(4.90)	(3.13)	(2.97)	(3.14)
access	–.95	.03	–.57	–.39	.50	–.04	.71	–.47	.46
	(1.01)	(.95)	(1.15)	(.52)	(.50)	(.58)	(.83)	(1.03)	(.95)
poverty	–15.70	–15.69	–25.99*	.17	.10	.26**	.15	.01	.11
	(13.84)	(9.99)	(15.59)	(.12)	(.07)	(.11)	(.13)	(.09)	(.13)
sqrt pop	.06	.05	.03	–.02	.02*	–.02	–.02	–.00	–.04
	(.06)	(.03)	(.05)	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
pop density	.00	.00	.00	–.00	.00	–.00	–.00	–.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	–19.91*	18.13**	–8.35	11.36	16.85	18.15*	23.37**	10.26	23.03**
	(10.35)	(8.60)	(11.38)	(7.59)	(10.55)	(10.12)	(10.27)	(7.99)	(10.46)
Copperbelt	–2.63	24.35**	10.39	2.47	25.93**	14.11	19.00*	14.15	21.67*
	(11.25)	(10.57)	(12.20)	(7.68)	(11.66)	(9.52)	(10.68)	(9.34)	(11.10)
Eastern	15.42	25.26***	23.65**	22.35***	20.04***	29.92***	22.91*	28.58***	32.00***
	(10.01)	(6.66)	(11.24)	(5.53)	(5.72)	(5.92)	(12.38)	(6.90)	(11.57)
Luapula	–6.85	19.29**	5.78	16.55**	30.59**	30.25***	34.55***	28.41***	43.40***
	(11.86)	(8.46)	(12.26)	(8.29)	(12.42)	(10.28)	(11.00)	(9.24)	(11.23)
Lusaka	10.76	27.72***	18.85	17.91**	20.46**	23.86**	17.92	27.22***	21.71
	(12.88)	(10.40)	(16.02)	(8.32)	(8.34)	(9.27)	(14.06)	(9.85)	(13.48)
Northern	.17	16.92**	9.67	11.95***	33.21***	25.38***	34.55***	27.94***	41.90***
	(9.46)	(7.19)	(9.93)	(4.53)	(12.54)	(9.18)	(9.79)	(8.00)	(9.60)
North-Western	.67	13.22*	8.97	–10.53	4.67	–11.56	23.68***	–3.84	7.05
	(8.34)	(7.41)	(7.11)	(9.06)	(5.43)	(12.08)	(2.98)	(21.40)	(15.70)
Southern	–10.71	7.42	–8.07	19.41**	24.68***	28.75***	10.92	19.88**	16.80
	(11.16)	(9.59)	(11.85)	(7.54)	(8.48)	(8.65)	(11.54)	(8.06)	(12.01)
Language Groups ($\geq$ 30 %)									
Bemba	10.11	–4.70	2.83	.13	–17.35	–9.18	–11.79**	7.35	–10.48**
	(7.60)	(4.81)	(8.41)	(4.19)	(10.92)	(8.81)	(4.96)	(6.24)	(5.16)
Tonga	4.07	.42	3.53	–4.31	–6.76	–7.91	–.67	8.67	3.73
	(7.22)	(7.04)	(8.88)	(6.59)	(6.87)	(8.10)	(7.46)	(6.26)	(8.03)
North-Western	1.40	8.64	–.87	20.13**	7.25	23.21**	–10.78	26.56	9.92
	(8.19)	(7.62)	(7.06)	(8.64)	(6.72)	(11.67)	(9.61)	(22.14)	(18.21)
Nyanja	–11.57	–14.87***	–14.42	8.67*	.21	6.89	–3.13	–4.30	–4.50
	(8.20)	(5.10)	(11.34)	(4.63)	(2.32)	(4.27)	(8.74)	(3.50)	(6.58)
Constant	41.59**	20.44**	61.15***	3.18	–25.31***	–7.06	14.15	–22.70**	12.33
	(16.41)	(9.83)	(17.08)	(10.10)	(8.82)	(9.57)	(14.84)	(9.86)	(16.10)
N	146	146	146	149	149	149	150	150	150

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses

Table D.22: Presidential vote lead and education infrastructure provision

	1998			2006			2010		
	impr	built	any	impr	built	any	impr	built	any
lead MMD	–.07	–.18***	–.13	.15**	.12*	.20**	–.03	.16***	.07
	(.12)	(.07)	(.11)	(.07)	(.07)	(.09)	(.05)	(.04)	(.06)
city	–5.62	–3.57	–6.56	–6.49	–5.77	–7.87	–2.05	5.46	4.58
	(11.27)	(8.09)	(13.35)	(6.31)	(4.30)	(6.26)	(5.61)	(4.47)	(5.22)
municipal	.31	–9.85***	–2.11	–6.39*	–1.51	–5.79	–7.84**	–4.28	–7.65**
	(5.00)	(3.48)	(5.05)	(3.61)	(4.06)	(4.87)	(3.15)	(2.97)	(3.13)
access	–.94	.06	–.54	–.35	.54	.02	.71	–.45	.47
	(1.01)	(.92)	(1.14)	(.53)	(.51)	(.60)	(.83)	(1.03)	(.94)
poverty	–15.42	–15.01	–25.33	.17	.11	.26**	.15	.01	.11
	(13.80)	(10.06)	(15.57)	(.12)	(.07)	(.10)	(.12)	(.09)	(.12)
sqrt pop	.06	.05	.03	–.02	.02	–.02	–.02	–.00	–.04
	(.06)	(.03)	(.06)	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
pop density	.00	.00	.00	–.00	.00	–.00	–.00	–.00	–.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Provinces									
Central	–19.76*	18.78**	–8.21	9.11	15.62	15.45	23.50**	8.63	22.41**
	(10.40)	(8.62)	(11.50)	(7.59)	(10.54)	(10.09)	(10.24)	(8.05)	(10.46)
Copperbelt	–2.41	25.23**	10.64	.43	25.50**	12.05	18.96*	13.74	21.56*
	(11.37)	(10.67)	(12.42)	(7.95)	(11.75)	(9.85)	(10.63)	(9.44)	(11.11)
Eastern	15.49	25.66***	23.64**	19.13***	16.87***	25.40***	23.16*	28.73***	32.04***
	(9.88)	(6.42)	(11.12)	(5.41)	(5.50)	(5.59)	(12.26)	(6.83)	(11.43)
Luapula	–6.84	19.56**	5.59	15.42*	31.04**	29.49***	34.60***	28.73***	43.55***
	(11.74)	(8.30)	(12.20)	(8.43)	(12.58)	(10.34)	(11.01)	(9.22)	(11.22)
Lusaka	10.51	27.20***	18.20	14.09*	16.99**	18.63**	18.18	26.34***	21.35
	(12.54)	(10.13)	(15.73)	(8.35)	(8.24)	(9.17)	(14.02)	(9.87)	(13.46)
Northern	.20	17.25**	9.53	9.40*	31.95**	22.45**	34.63***	27.75***	41.85***
	(9.43)	(7.13)	(10.04)	(4.99)	(12.51)	(9.40)	(9.79)	(8.06)	(9.62)
North-Western	–.62	9.62	6.36	–7.78	7.35	–7.75	23.50***	–2.80	7.50
	(8.50)	(7.49)	(7.57)	(8.68)	(5.10)	(11.66)	(2.93)	(20.95)	(15.48)
Southern	–10.56	8.09	–7.92	19.77***	24.97***	29.16***	11.08	19.87**	16.79
	(11.18)	(9.56)	(11.94)	(7.46)	(8.78)	(8.65)	(11.49)	(8.15)	(11.96)
Language Groups ($\geq$ 30 %)									
Bemba	10.26	–4.30	3.08	–.81	–18.08	–10.34	–11.81**	8.63	–9.98*
	(7.71)	(4.87)	(8.52)	(4.30)	(11.45)	(9.23)	(5.06)	(6.38)	(5.19)
Tonga	4.20	.74	3.79	–3.27	–6.61	–6.85	–.80	11.09*	4.70
	(7.27)	(7.11)	(8.94)	(6.46)	(6.86)	(7.90)	(7.60)	(6.58)	(8.23)
North-Western	2.16	10.98	.61	17.28**	4.67	19.41*	–10.69	26.04	9.73
	(8.71)	(7.78)	(7.54)	(8.06)	(6.64)	(11.07)	(9.55)	(21.68)	(18.04)
Nyanja	–11.25	–14.02***	–13.74	8.56*	.11	6.75*	–3.04	–5.07	–4.83
	(8.08)	(5.21)	(11.33)	(4.49)	(2.24)	(3.99)	(8.78)	(3.59)	(6.58)
Constant	37.61***	9.54	52.71***	14.90	–14.86*	8.90	11.40	–9.93	17.93
	(13.79)	(8.82)	(14.93)	(10.68)	(8.36)	(9.36)	(14.33)	(9.74)	(15.14)
N	146	146	146	149	149	149	150	150	150

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses

Table D.23: Presidential vote share and infrastructure improvement or construction: municipal and rural constituencies

	1998		2006		2010	
	impr	built	impr	built	impr	built
vote MMD	.013	–.291**	.155	.376**	.116	.397***
	(.18)	(.12)	(.15)	(.16)	(.13)	(.11)
municipal	3.594	–16.343***	–13.489***	.143	–7.266**	–6.200*
	(6.40)	(3.59)	(4.26)	(4.69)	(3.34)	(3.28)
access transport	–2.066**	–1.387***	–.131	.053	–.627*	–.193
	(.94)	(.45)	(.16)	(.11)	(.35)	(.56)
access health	17.395*	–13.202	.086	–.670**	–.096	–.505
	(10.14)	(11.58)	(.27)	(.28)	(.65)	(.51)
access education	1.675	.137	–.947	1.147	.475	–1.058
	(1.37)	(1.22)	(.73)	(.70)	(.93)	(1.48)
sqrt pop	–.010	.080	–.043**	.016	–.028	–.006
	(.08)	(.06)	(.02)	(.02)	(.03)	(.02)
pop density	.131	.246***	.098	–.037	.050	–.015
	(.09)	(.08)	(.07)	(.05)	(.07)	(.05)
poverty	.686	–16.733	.356**	.061	.177	.068
	(19.61)	(11.07)	(.14)	(.10)	(.12)	(.12)
Provinces						
Central	–17.415	9.027	35.932***	18.953	26.544**	–4.881
	(11.26)	(9.59)	(13.50)	(12.94)	(11.88)	(10.58)
Copperbelt	–13.355	8.189	29.464***	21.601*	22.631	–.628
	(10.38)	(10.29)	(9.40)	(12.34)	(13.68)	(11.80)
Eastern	18.095*	26.369***	36.292***	10.324	36.800***	33.037***
	(9.68)	(5.56)	(6.78)	(7.63)	(13.12)	(8.90)
Luapula	–4.008	23.740**	39.547***	22.869*	45.632***	13.697
	(9.24)	(10.20)	(11.68)	(12.76)	(11.39)	(10.65)
Lusaka	25.737*	43.134***	38.710***	17.576*	29.482*	24.753**
	(15.37)	(8.26)	(11.59)	(10.12)	(16.23)	(11.55)
Northern	–1.308	14.769	30.303***	28.177**	47.954***	23.885***
	(7.32)	(8.93)	(6.71)	(11.33)	(10.01)	(8.28)
North-Western	.677	16.386***	–11.593	3.245	17.402**	–10.242
	(7.25)	(4.54)	(8.05)	(9.49)	(8.13)	(25.40)
Southern	–.201	11.009	39.561***	19.534	19.704	10.258
	(13.28)	(10.09)	(12.91)	(13.61)	(13.61)	(11.71)
Language Groups (≥ 30 %)						
Bemba	12.251**	–.121	–14.290**	–22.730**	–9.212	14.766*
	(5.61)	(6.24)	(6.14)	(10.33)	(7.23)	(8.23)
Tonga	6.516	3.747	–20.340*	–11.529	6.487	21.215*
	(9.38)	(7.46)	(11.28)	(12.38)	(11.62)	(11.67)
North-Western	6.943	5.303	36.102***	–.871	3.760	24.836
	(4.79)	(4.02)	(8.18)	(10.30)	(11.83)	(26.21)
Nyanja	–11.831	–23.692***	.421	4.486	–.827	–8.212
	(9.85)	(5.44)	(4.70)	(5.40)	(8.92)	(5.66)
Constant	27.969	27.760**	8.215	–3.709	9.169	–11.255
	(20.67)	(11.69)	(14.77)	(10.21)	(16.02)	(12.79)
N	129	129	132	132	133	133

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses

Table D.24: Presidential lead and infrastructure improvement or construction: municipal and rural constituencies

	1998		2006		2010	
	impr	built	impr	built	impr	built
lead MMD	–.041	–.192***	.092	.206**	.054	.220***
	(.11)	(.07)	(.09)	(.08)	(.06)	(.06)
municipal	2.978	–16.710***	–13.628***	–.291	–7.254**	–6.560**
	(6.58)	(3.55)	(4.29)	(4.70)	(3.31)	(3.31)
access transport	–2.035**	–1.359***	–.137	.042	–.620*	–.166
	(.94)	(.44)	(.16)	(.11)	(.35)	(.55)
access health	17.794*	–12.646	.086	–.662**	–.093	–.489
	(10.09)	(11.56)	(.27)	(.28)	(.65)	(.50)
access education	1.661	.182	–.914	1.215*	.465	–1.051
	(1.35)	(1.20)	(.73)	(.72)	(.91)	(1.46)
sqrt pop	–.014	.081	–.044**	.013	–.029	–.008
	(.08)	(.06)	(.02)	(.02)	(.03)	(.02)
pop density	.136	.248***	.097	–.041	.047	–.003
	(.09)	(.08)	(.07)	(.05)	(.07)	(.05)
poverty	–.084	–16.032	.355**	.061	.179	.063
	(19.44)	(11.12)	(.14)	(.10)	(.12)	(.12)
Provinces						
Central	–15.467	9.722	34.558**	16.069	26.450**	–6.806
	(11.27)	(9.90)	(13.36)	(12.92)	(11.93)	(10.57)
Copperbelt	–10.976	9.124	28.132***	19.392	22.912*	–1.479
	(10.50)	(10.68)	(9.59)	(12.66)	(13.60)	(11.79)
Eastern	20.365**	26.973***	34.514***	5.990	36.214***	33.105***
	(9.39)	(5.35)	(6.43)	(7.65)	(13.07)	(8.88)
Luapula	–1.592	23.965**	38.777***	21.796	45.535***	14.412
	(9.42)	(10.28)	(12.00)	(13.15)	(11.57)	(10.72)
Lusaka	27.691*	42.838***	36.533***	12.371	28.948*	23.916**
	(15.22)	(8.01)	(11.47)	(9.79)	(16.32)	(11.57)
Northern	1.125	15.218	28.703***	24.919**	47.791***	23.762***
	(7.48)	(9.26)	(6.92)	(11.51)	(10.07)	(8.42)
North-Western	–.185	12.624***	–9.973	7.056	17.744**	–8.526
	(7.68)	(4.17)	(7.63)	(8.76)	(8.01)	(24.69)
Southern	1.798	11.745	39.816***	20.027	19.402	10.553
	(13.11)	(10.23)	(13.06)	(13.24)	(13.71)	(11.85)
Language Groups (≥ 30 %)						
Bemba	13.032**	.346	–14.910**	–24.133**	–9.304	16.223*
	(5.93)	(6.33)	(6.19)	(10.58)	(7.25)	(8.46)
Tonga	6.548	4.082	–19.685*	–10.338	6.562	24.136**
	(9.40)	(7.57)	(11.21)	(12.06)	(11.93)	(12.00)
North-Western	8.241	7.737*	34.364***	–4.949	3.570	24.116
	(5.46)	(4.39)	(7.72)	(10.12)	(11.73)	(25.49)
Nyanja	–12.370	–22.939***	.262	4.175	–.940	–9.376
	(9.80)	(5.30)	(4.67)	(5.31)	(8.99)	(5.68)
Constant	29.812*	16.354	15.224	12.628	14.574	6.155
	(17.85)	(10.95)	(14.69)	(10.67)	(14.60)	(12.59)
N	129	129	132	132	133	133

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.25: Presidential vote share and infrastructure improvement or construction: rural constituencies

	1998		2006		2010	
	impr	built	impr	built	impr	built
vote MMD	–.036	–.359***	.134	.227	.166	.551***
	(.20)	(.14)	(.16)	(.16)	(.17)	(.13)
access transport	–2.274**	–1.232**	–.302*	–.075	–.692*	–.430
	(1.07)	(.48)	(.16)	(.10)	(.41)	(.63)
access health	17.938	–2.723	.477*	–.301	–.087	–.259
	(12.13)	(13.84)	(.24)	(.26)	(.76)	(.59)
access education	1.015	.167	–1.030	.903	1.056	–.934
	(1.64)	(1.50)	(.77)	(.73)	(1.21)	(2.19)
sqrt pop	.007	.068	–.038	.015	–.023	.005
	(.10)	(.07)	(.03)	(.02)	(.04)	(.03)
pop density	–.085	.201	–.234*	–.201	.022	–.097
	(.29)	(.20)	(.12)	(.15)	(.19)	(.14)
poverty	–25.479	–22.344*	.413*	.145	.154	.059
	(22.93)	(12.52)	(.21)	(.12)	(.16)	(.14)
Provinces						
Central	–21.724*	5.386	31.634**	1.367	21.234	–11.984
	(11.44)	(8.77)	(14.78)	(10.40)	(14.63)	(12.34)
Copperbelt	–16.768	–1.047	32.247***	10.068	15.263	–15.558
	(12.62)	(10.23)	(9.10)	(10.09)	(19.24)	(15.84)
Eastern	21.509**	29.219***	46.467***	13.793	37.580**	38.410***
	(8.97)	(5.89)	(5.81)	(9.68)	(14.42)	(10.52)
Luapula	–12.887	13.988	44.667***	14.712	41.874***	14.065
	(11.19)	(9.29)	(13.18)	(10.65)	(15.36)	(13.47)
Lusaka	25.689*	41.537***	41.635***	15.759	31.396*	26.204*
	(15.18)	(9.28)	(10.11)	(10.69)	(17.93)	(13.22)
Northern	–7.911	7.144	32.478***	16.305*	41.236***	20.359*
	(7.06)	(6.92)	(5.73)	(8.60)	(12.49)	(10.85)
North-Western	3.798	13.918***	–9.041	6.094	20.168**	–7.395
	(8.82)	(4.77)	(8.78)	(9.84)	(8.62)	(26.42)
Southern	.072	10.145	39.059***	7.212	17.599	10.548
	(13.57)	(10.33)	(13.19)	(10.98)	(17.02)	(13.94)
Language Groups (≥ 30 %)						
Bemba	22.360***	10.467	–9.125	–5.398	–1.602	24.343***
	(6.08)	(6.45)	(6.71)	(5.27)	(8.69)	(8.97)
Tonga	10.789	7.926	–12.929	4.183	11.715	30.040***
	(8.50)	(7.38)	(12.01)	(8.22)	(11.56)	(10.70)
North-Western	6.672	6.128	39.438***	–.597	3.603	26.988
	(5.47)	(4.69)	(7.96)	(11.15)	(13.85)	(27.29)
Nyanja	–16.293	–21.737***	2.634	4.130	–3.316	–7.192
	(10.66)	(7.19)	(4.67)	(5.53)	(10.66)	(6.53)
Constant	52.647**	35.061**	–.661	–7.146	5.577	–24.737
	(24.72)	(14.58)	(19.43)	(11.63)	(21.21)	(17.51)
N	96	96	99	99	100	100

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses

Table D.26: Presidential lead and infrastructure improvement or construction: rural constituencies

	1998		2006		2010	
	impr	built	impr	built	impr	built
lead MMD	–.081	–.230***	.132	.159**	.082	.326***
	(.12)	(.08)	(.09)	(.07)	(.09)	(.06)
access transport	–2.224**	–1.209**	–.305*	–.083	–.682*	–.402
	(1.08)	(.47)	(.16)	(.10)	(.41)	(.61)
access health	18.142	–2.538	.438*	–.321	–.082	–.231
	(12.26)	(13.83)	(.24)	(.25)	(.76)	(.57)
access education	1.005	.188	–.919	1.009	1.064	–.797
	(1.62)	(1.48)	(.77)	(.74)	(1.19)	(2.13)
sqrt pop	.005	.076	–.041	.011	–.023	.002
	(.10)	(.07)	(.03)	(.02)	(.04)	(.03)
pop density	–.109	.189	–.221*	–.195	.026	–.050
	(.30)	(.19)	(.13)	(.13)	(.20)	(.14)
poverty	–26.354	–21.437*	.403*	.140	.154	.044
	(22.44)	(12.69)	(.21)	(.12)	(.16)	(.14)
Provinces						
Central	–20.218*	5.640	30.502**	–.320	20.692	–16.136
	(11.28)	(9.10)	(14.68)	(10.35)	(14.74)	(12.26)
Copperbelt	–15.202	–.899	29.296***	7.369	14.988	–20.780
	(12.40)	(10.43)	(9.32)	(10.18)	(19.35)	(15.55)
Eastern	24.046***	29.582***	45.149***	11.395	37.063**	39.554***
	(8.77)	(5.62)	(5.41)	(9.63)	(14.48)	(10.61)
Luapula	–10.942	13.501	42.947***	13.409	41.610***	14.682
	(11.16)	(9.22)	(13.39)	(10.87)	(15.60)	(13.55)
Lusaka	27.093*	40.465***	39.988***	12.839	30.628*	25.056*
	(15.04)	(8.91)	(9.92)	(10.35)	(18.09)	(13.46)
Northern	–6.056	6.991	30.255***	13.761	40.789***	19.221*
	(6.78)	(7.21)	(5.92)	(8.95)	(12.56)	(10.96)
North-Western	2.819	9.928**	–7.360	8.568	20.801**	–4.137
	(8.75)	(4.05)	(8.13)	(9.28)	(8.53)	(25.41)
Southern	1.699	10.319	40.949***	8.517	17.190	11.065
	(13.27)	(10.43)	(13.69)	(10.53)	(17.13)	(14.24)
Language Groups (≥ 30 %)						
Bemba	24.040***	11.243	–11.148*	–7.172	–1.241	28.275***
	(5.99)	(6.76)	(6.59)	(5.03)	(8.88)	(9.12)
Tonga	11.479	8.523	–12.147	5.038	12.325	35.797***
	(8.32)	(7.73)	(11.79)	(7.60)	(12.07)	(11.12)
North-Western	8.322	8.945*	37.537***	–3.283	3.353	25.992
	(6.11)	(5.03)	(7.36)	(10.98)	(13.76)	(26.29)
Nyanja	–16.245	–20.422***	2.218	3.710	–3.544	–9.046
	(10.61)	(6.99)	(4.91)	(5.39)	(10.81)	(6.57)
Constant	53.025**	20.523	7.445	4.032	13.150	–1.864
	(20.71)	(13.98)	(19.08)	(11.87)	(19.30)	(16.44)
N	96	96	99	99	100	100

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses

Table D.27: Presidential vote share and infrastructure improvement and construction: rural and municipal constituencies

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
votes MMD	–.175	–.165	–.166	–.185	–.148	–.126
	(.15)	(.16)	(.15)	(.13)	(.11)	(.12)
votes 2006	.164	.164	.133	.325**	.296**	.234
	(.22)	(.22)	(.22)	(.15)	(.14)	(.14)
votes 2010	.148	.146	.036	.355**	.320**	.196
	(.19)	(.19)	(.20)	(.16)	(.15)	(.16)
2006	–25.211*	–24.882*	–31.417**	–26.827**	–24.755**	–26.568**
	(14.34)	(14.84)	(15.11)	(11.61)	(10.90)	(12.69)
2010	–28.087*	–27.658*	–26.703	–24.346**	–21.908**	–15.344
	(14.53)	(14.90)	(16.17)	(11.72)	(10.73)	(13.63)
access trans	–.341**	–.326**	–.084	.039	.001	.113
	(.17)	(.14)	(.16)	(.22)	(.18)	(.21)
access health	.410	.404	.772**	–.228	–.156	.078
	(.29)	(.29)	(.35)	(.26)	(.21)	(.23)
access edu	–.532	–.547	.139	–.214	–.143	.356
	(.70)	(.61)	(.75)	(.75)	(.59)	(.65)
municipal	–4.790	–4.939*		–6.053*	–4.796*	
	(3.61)	(2.68)		(3.66)	(2.78)	
poverty	.325***	.323***	.404***	.176**	.171**	.224**
	(.10)	(.10)	(.11)	(.09)	(.09)	(.10)
pop density	.078	.079	.060	.037	.032	–.565*
	(.08)	(.05)	(.35)	(.06)	(.04)	(.32)
sqrt pop	–.034*	–.036**	–.059*	.019	.013	–.003
	(.02)	(.02)	(.03)	(.02)	(.01)	(.03)
Provinces						
Central	19.052**	18.086***		9.905	7.089	
	(7.80)	(6.25)		(9.26)	(7.33)	
Copperbelt	19.830**	18.756**		15.909*	12.541*	
	(8.21)	(7.38)		(8.60)	(7.15)	
Eastern	30.974***	29.440***		19.724***	17.512***	
	(7.56)	(5.32)		(6.29)	(4.34)	
Luapula	31.462***	30.559***		19.557**	17.366**	
	(7.63)	(6.52)		(7.81)	(7.07)	
Lusaka	33.915***	32.178***		29.263***	26.338***	
	(9.03)	(6.48)		(8.18)	(5.64)	
Northern	27.486***	26.440***		21.608***	18.548***	
	(6.89)	(5.51)		(7.62)	(6.73)	
North-Western	2.564	2.322		4.342	2.521	
	(4.17)	(3.46)		(8.72)	(7.48)	
Southern	21.115**	20.304***		12.960	10.287	
	(9.21)	(7.09)		(11.72)	(8.09)	
Language Groups (≥ 30 %)						
Bemba	–4.515	–4.607		–4.244	–4.076	
	(4.51)	(3.84)		(6.34)	(5.62)	
Tonga	–4.889	–4.607		1.189	1.497	
	(7.72)	(5.47)		(10.83)	(7.31)	
North-Western	16.679***	16.116***		10.061	9.276	
	(5.39)	(4.32)		(9.23)	(7.92)	
Nyanja	–4.000	–3.293		–7.257	–7.122**	
	(6.11)	(3.74)		(4.46)	(2.85)	
Constant	38.395***	39.130***	56.944***	13.626*	15.231**	37.049***
	(10.61)	(10.26)	(13.58)	(7.26)	(6.62)	(12.09)
N	394	394	394	394	394	394

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.28: Presidential vote share and infrastructure improvement and construction: rural constituencies

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
votes MMD	–.162	–.145	–.156	–.336***	–.282**	–.207
	(.18)	(.17)	(.19)	(.13)	(.12)	(.13)
votes 2006	.134	.125	.049	.465***	.414***	.324**
	(.25)	(.24)	(.25)	(.16)	(.15)	(.15)
votes 2010	.102	.093	.043	.585***	.528***	.352**
	(.25)	(.23)	(.25)	(.17)	(.16)	(.16)
2006	–12.391	–11.795	–19.029	–31.172**	–27.190*	–31.890**
	(18.95)	(18.26)	(20.98)	(14.23)	(14.01)	(15.18)
2010	–16.224	–15.452	–22.539	–31.960**	–27.541**	–22.719
	(20.09)	(18.43)	(21.54)	(14.20)	(13.85)	(15.78)
access trans	–.440*	–.422**	–.173	–.104	–.127	.009
	(.24)	(.17)	(.17)	(.24)	(.17)	(.19)
access health	.564	.554*	.858**	–.106	–.095	.107
	(.35)	(.30)	(.36)	(.26)	(.21)	(.21)
access edu	–.552	–.569	–.161	.122	.251	.701
	(.96)	(.76)	(.86)	(1.01)	(.72)	(.76)
poverty	.236*	.237*	.370**	.111	.104	.230*
	(.13)	(.13)	(.15)	(.11)	(.11)	(.13)
pop density	–.104	–.105	.913	–.091	–.097	–.843
	(.16)	(.10)	(.74)	(.15)	(.10)	(.62)
sqrt pop	–.026	–.029	–.072**	.016	.011	–.010
	(.03)	(.02)	(.03)	(.02)	(.01)	(.03)
Provinces						
Central	14.988	13.792**		2.177	.403	
	(9.33)	(6.45)		(8.32)	(5.80)	
Copperbelt	18.227*	16.936*		5.106	2.511	
	(10.90)	(8.74)		(8.13)	(5.54)	
Eastern	32.493***	30.629***		24.303***	21.936***	
	(9.12)	(6.12)		(7.44)	(5.51)	
Luapula	28.931***	27.809***		16.044**	14.662**	
	(9.31)	(7.05)		(7.92)	(5.96)	
Lusaka	33.503***	31.444***		28.471***	25.623***	
	(8.91)	(6.92)		(7.87)	(5.79)	
Northern	23.330***	22.015***		14.913**	12.861**	
	(7.63)	(5.39)		(7.08)	(5.18)	
North-Western	4.351	4.085		4.534	2.778	
	(4.33)	(3.60)		(8.78)	(7.30)	
Southern	19.050*	17.865**		9.836	7.492	
	(10.33)	(7.19)		(9.54)	(6.66)	
Language Groups (≥ 30 %)						
Bemba	1.064	.868		6.540	5.812*	
	(5.83)	(3.60)		(5.27)	(3.42)	
Tonga	–.192	.071		10.161	9.683**	
	(7.72)	(4.74)		(7.30)	(4.89)	
North-Western	18.399***	17.519***		11.536	10.737	
	(6.57)	(5.14)		(9.20)	(7.92)	
Nyanja	–3.254	–2.461		–5.774	–5.590*	
	(5.77)	(3.92)		(4.35)	(3.29)	
Constant	34.283***	34.971***	46.269***	21.567***	21.586***	40.447***
	(12.14)	(10.72)	(14.60)	(7.76)	(7.05)	(10.96)
N	295	295	295	295	295	295

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.29: Presidential lead and infrastructure improvement and construction: rural and municipal constituencies

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
lead MMD	–.119	–.112	–.103	–.136*	–.110*	–.098
	(.09)	(.09)	(.09)	(.07)	(.06)	(.07)
lead 2006	.131	.132	.099	.195**	.176**	.143*
	(.11)	(.11)	(.11)	(.08)	(.07)	(.08)
lead 2010	.109	.106	.047	.226**	.201**	.142
	(.10)	(.10)	(.10)	(.09)	(.08)	(.09)
2006	–19.442**	–19.083*	–26.115***	–16.307*	–15.160*	–19.288*
	(9.70)	(9.94)	(9.20)	(8.60)	(8.39)	(9.73)
2010	–23.306**	–22.859**	–26.416***	–11.017	–9.704	–8.773
	(9.17)	(9.37)	(9.38)	(7.77)	(7.69)	(9.98)
access trans	–.341**	–.326**	–.088	.035	–.003	.106
	(.17)	(.14)	(.16)	(.22)	(.18)	(.20)
access health	.398	.393	.769**	–.221	–.148	.087
	(.29)	(.29)	(.35)	(.26)	(.21)	(.23)
access edu	–.506	–.520	.138	–.175	–.106	.403
	(.69)	(.61)	(.74)	(.75)	(.59)	(.66)
municipal	–4.859	–5.006*		–6.285*	–5.009*	
	(3.62)	(2.67)		(3.67)	(2.79)	
poverty	.323***	.321***	.399***	.177**	.172**	.226**
	(.10)	(.10)	(.11)	(.08)	(.08)	(.10)
pop density	.080	.081	.083	.038	.033	–.542*
	(.08)	(.05)	(.35)	(.06)	(.04)	(.31)
sqrt pop	–.034*	–.036**	–.059*	.018	.012	–.004
	(.02)	(.02)	(.03)	(.02)	(.01)	(.03)
Provinces						
Central	19.082**	18.069***		9.775	6.888	
	(7.81)	(6.29)		(9.20)	(7.32)	
Copperbelt	19.641**	18.517**		16.268*	12.805*	
	(8.33)	(7.48)		(8.61)	(7.16)	
Eastern	31.257***	29.679***		19.516***	17.210***	
	(7.51)	(5.19)		(6.28)	(4.27)	
Luapula	31.325***	30.398***		20.067**	17.785**	
	(7.66)	(6.57)		(7.86)	(7.15)	
Lusaka	33.920***	32.143***		28.659***	25.667***	
	(8.98)	(6.44)		(8.07)	(5.51)	
Northern	27.446***	26.354***		21.691***	18.537***	
	(6.94)	(5.57)		(7.67)	(6.77)	
North-Western	1.794	1.648		4.099	2.486	
	(4.16)	(3.51)		(8.43)	(7.30)	
Southern	21.398**	20.594***		13.302	10.579	
	(9.01)	(7.01)		(11.43)	(8.03)	
Language Groups (≥ 30 %)						
Bemba	–4.430	–4.541		–4.015	–3.884	
	(4.45)	(3.83)		(6.42)	(5.74)	
Tonga	–4.680	–4.377		1.653	1.949	
	(7.53)	(5.45)		(10.57)	(7.25)	
North-Western	17.111***	16.476***		10.196	9.255	
	(5.49)	(4.41)		(9.12)	(7.83)	
Nyanja	–3.908	–3.224		–7.364	–7.236**	
	(6.19)	(3.84)		(4.48)	(2.85)	
Constant	32.468***	33.581***	50.425***	7.833*	10.777***	32.992***
	(6.46)	(5.45)	(9.98)	(4.65)	(3.99)	(9.36)
N	394	394	394	394	394	394

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.30: Presidential lead and infrastructure improvement and construction: rural constituencies

	Improvement			Construction		
	Tobit RE	GLS RE	GLS FE	Tobit RE	GLS RE	GLS FE
lead MMD	–.123	–.113	–.102	–.225***	–.193***	–.152**
	(.11)	(.11)	(.12)	(.08)	(.07)	(.07)
lead 2006	.159	.156	.096	.292***	.263***	.214***
	(.14)	(.13)	(.14)	(.08)	(.08)	(.08)
lead 2010	.097	.093	.052	.359***	.325***	.235**
	(.14)	(.13)	(.14)	(.10)	(.10)	(.09)
2006	–7.679	–7.331	–16.414	–15.045	–12.971	–20.848*
	(12.31)	(12.35)	(13.99)	(11.15)	(11.32)	(12.24)
2010	–13.539	–13.007	–21.464	–9.310	–7.037	–9.508
	(12.19)	(11.85)	(13.39)	(10.70)	(10.61)	(11.88)
access trans	–.436*	–.420***	–.166	–.109	–.131	.003
	(.23)	(.16)	(.16)	(.24)	(.16)	(.19)
access health	.535	.523*	.832**	–.105	–.095	.108
	(.34)	(.29)	(.35)	(.25)	(.21)	(.20)
access edu	–.502	–.518	–.172	.199	.325	.787
	(.95)	(.75)	(.84)	(1.00)	(.72)	(.76)
poverty	.229*	.229*	.362**	.108	.101	.226*
	(.13)	(.13)	(.15)	(.11)	(.11)	(.13)
pop density	–.104	–.105	.873	–.088	–.095	–.816
	(.15)	(.10)	(.71)	(.15)	(.10)	(.58)
sqrt pop	–.027	–.029	–.072**	.015	.010	–.012
	(.03)	(.02)	(.03)	(.02)	(.01)	(.03)
Provinces						
Central	15.105*	13.869**		1.629	–.139	
	(9.08)	(6.31)		(8.07)	(5.69)	
Copperbelt	17.651	16.299*		4.489	1.898	
	(10.80)	(8.71)		(7.90)	(5.39)	
Eastern	33.121***	31.252***		24.099***	21.715***	
	(8.89)	(5.93)		(7.53)	(5.48)	
Luapula	28.658***	27.556***		16.023**	14.640**	
	(9.14)	(6.97)		(7.79)	(5.92)	
Lusaka	33.737***	31.655***		27.431***	24.626***	
	(8.64)	(6.64)		(7.96)	(5.79)	
Northern	23.279***	21.944***		14.489**	12.429**	
	(7.44)	(5.26)		(6.92)	(5.13)	
North-Western	3.687	3.522		4.079	2.551	
	(4.15)	(3.44)		(8.31)	(6.94)	
Southern	19.812**	18.652***		9.932	7.610	
	(9.96)	(7.00)		(9.15)	(6.48)	
Language Groups (≥ 30 %)						
Bemba	1.047	.844		7.100	6.356*	
	(5.57)	(3.53)		(5.03)	(3.35)	
Tonga	.162	.456		11.056	10.545**	
	(7.37)	(4.58)		(6.88)	(4.69)	
North-Western	18.884***	17.927***		11.922	10.967	
	(6.54)	(5.19)		(9.02)	(7.81)	
Nyanja	–3.153	–2.401		–5.719	–5.567*	
	(5.77)	(3.97)		(4.47)	(3.30)	
Constant	29.294***	30.662***	41.555***	10.139*	12.211**	33.876***
	(7.64)	(6.02)	(10.09)	(5.59)	(4.89)	(8.47)
N	295	295	295	295	295	295

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%
Clustered standard errors in parentheses (bootstrapped for tobit random effects model)

Table D.31: Vote shares and infrastructure construction: presidential elections, 1998 LCMS

	(1)	(2)	(3)	(4)	(5)
votes MMD	–.190*	–.265**	.017	–.285**	.029
	(.11)	(.12)	(.12)	(.13)	(.13)
city	–13.431	–12.896	–14.559*	–10.512	–13.843**
	(9.54)	(9.12)	(7.36)	(9.26)	(6.89)
municipal	–10.359***	–9.739***	–11.638***	–8.914**	–11.653***
	(3.56)	(3.58)	(3.78)	(3.62)	(3.69)
access transport	–.851*	–1.049***	–.609	–1.014**	–.586
	(.43)	(.40)	(.45)	(.39)	(.46)
access health	–2.141	–2.492	–1.365	–1.034	–1.454
	(8.23)	(8.23)	(8.00)	(8.41)	(8.06)
access education	–.314	–.278	–.645	–.337	–.628
	(1.06)	(1.08)	(1.17)	(1.07)	(1.15)
sqrt pop	.089**	.085**	.089**	.088**	.087**
	(.04)	(.04)	(.04)	(.04)	(.04)
pop density	–.001	–.000	.000	–.001	.000
	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	–15.178	–18.143*	–16.028	–15.489	–15.304
	(10.96)	(10.66)	(12.33)	(10.55)	(12.00)
km Lusaka			–.006		–.005
			(.01)		(.01)
km Prov. Capital			–.022		–.025*
			(.01)		(.01)
Provinces					
Central	9.262*	11.071		13.379	
	(4.96)	(8.78)		(9.21)	
Copperbelt	19.106**	21.187*		23.254**	
	(8.32)	(10.78)		(10.02)	
Eastern	10.085**	29.453***		28.409***	
	(5.09)	(6.13)		(6.64)	
Luapula	16.588**	20.435**		23.093**	
	(6.77)	(9.44)		(10.26)	
Lusaka	19.921***	41.719***		33.326***	
	(5.40)	(8.64)		(7.66)	
Northern	10.251*	14.015*		16.689*	
	(5.22)	(7.95)		(8.87)	
North-Western	18.452***	13.199***		5.804	
	(4.25)	(4.29)		(7.40)	
Southern	11.910**	9.372		8.407	
	(5.37)	(10.20)		(14.22)	
Ethnic Groups		(≥ 30 %)		(share)	
Bemba		1.836	–.541	.015	.007
		(6.05)	(5.75)	(.08)	(.07)
Tonga		6.530	.635	.119	.041
		(7.65)	(6.29)	(.15)	(.09)
North-Western		7.840*	8.403	.189	.143**
		(4.46)	(5.10)	(.12)	(.06)
Nyanja		–20.083***	–3.495	–.170***	–.012
		(6.08)	(6.65)	(.05)	(.07)
Constant	22.732*	26.379**	29.064**	22.870**	25.539**
	(11.65)	(11.22)	(13.22)	(11.31)	(12.41)
N	146	146	146	146	146

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses

Table D.32: Vote shares and infrastructure construction: presidential elections, 2006 LCMS

	(1)	(2)	(3)	(4)	(5)
votes MMD	.357***	.426***	.464***	.318**	.412**
	(.13)	(.14)	(.17)	(.15)	(.18)
city	–.876	–1.925	–2.407	–7.311	–5.527
	(7.36)	(6.22)	(6.09)	(6.29)	(5.92)
municipal	–1.058	–.909	–1.176	–3.193	–1.969
	(4.97)	(4.06)	(5.00)	(4.11)	(5.05)
access transport	.048	.059	.045	.060	.038
	(.12)	(.10)	(.10)	(.10)	(.10)
access health	–.500*	–.676**	–.573**	–.583**	–.506**
	(.26)	(.27)	(.25)	(.25)	(.25)
access education	.933	1.138*	.835	1.082*	.809
	(.62)	(.68)	(.61)	(.63)	(.61)
sqrt pop	.032*	.024	.037*	.023	.037*
	(.02)	(.02)	(.02)	(.02)	(.02)
pop density	–.003	–.004	–.001	–.002	.002
	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	.106	.062	.039	.074	.037
	(.09)	(.08)	(.08)	(.08)	(.09)
km Lusaka			.010		.011
			(.01)		(.01)
km Prov. Capital			.001		.004
			(.01)		(.01)
Provinces					
Central	–.094	18.464*		24.421**	
	(5.04)	(10.97)		(10.48)	
Copperbelt	–3.150	18.469*		23.402**	
	(6.66)	(10.93)		(10.85)	
Eastern	12.947***	9.617		6.857	
	(4.84)	(7.40)		(8.12)	
Luapula	.390	21.801*		28.616**	
	(7.76)	(11.99)		(12.85)	
Lusaka	19.670***	17.397*		23.587**	
	(6.60)	(9.72)		(9.08)	
Northern	12.024*	27.553**		32.480***	
	(7.03)	(10.72)		(12.09)	
North-Western	2.309	3.086		7.779	
	(5.26)	(9.22)		(11.54)	
Southern	8.780*	20.903*		38.615***	
	(4.92)	(10.61)		(10.41)	
Ethnic Groups		(≥ 30 %)		(share)	
Bemba		–23.426**	–11.416*	–.291**	–.098
		(9.21)	(6.80)	(.11)	(.08)
Tonga		–12.586	2.757	–.374***	.030
		(9.93)	(5.89)	(.11)	(.06)
North-Western		–.804	–7.623	–.063	–.093
		(10.11)	(5.68)	(.14)	(.07)
Nyanja		4.679	8.881*	.068	.112**
		(5.00)	(5.23)	(.06)	(.06)
Constant	–11.368	–6.846	–6.943	–3.348	–6.973
	(10.95)	(9.10)	(12.12)	(9.61)	(12.32)
N	149	149	149	149	149

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%
Clustered standard errors in parentheses

Table D.33: Presidential vote share and infrastructure construction: 2010 LCMS

	(1)	(2)	(3)	(4)	(5)
votes MMD	.278***	.418***	.246**	.388***	.315***
	(.09)	(.10)	(.11)	(.12)	(.10)
city	–.905	5.165	.806	5.279	–.252
	(5.30)	(5.06)	(4.20)	(7.17)	(4.34)
municipal	–8.302***	–6.320**	–5.784*	–5.729*	–5.715*
	(2.68)	(2.89)	(3.08)	(3.36)	(3.28)
access transport	–.070	–.213	–.002	–.280	–.014
	(.69)	(.55)	(.63)	(.56)	(.67)
access health	–.475	–.525	–.229	–.471	–.350
	(.51)	(.50)	(.48)	(.49)	(.50)
access education	–.838	–.614	–.741	–.701	–.577
	(1.42)	(1.29)	(1.29)	(1.33)	(1.37)
sqrt pop	–.007	–.007	.018	–.011	.007
	(.02)	(.02)	(.02)	(.02)	(.02)
pop density	–.000	.000	.001	–.001	.002**
	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	.088	.073	–.000	.080	.001
	(.12)	(.11)	(.10)	(.12)	(.09)
km Lusaka			.034***		.033***
			(.01)		(.01)
km Prov. Capital			.010		.011
			(.02)		(.02)
Provinces					
Central	3.846	–5.338		–1.580	
	(9.14)	(9.69)		(11.69)	
Copperbelt	7.053	–1.224		–1.567	
	(10.13)	(10.62)		(11.31)	
Eastern	16.120*	34.020***		27.142**	
	(8.49)	(8.69)		(12.12)	
Luapula	17.453*	14.397		13.374	
	(9.88)	(10.36)		(11.82)	
Lusaka	11.943	25.470**		15.990	
	(12.65)	(11.53)		(13.96)	
Northern	24.273**	23.933***		23.807**	
	(10.09)	(8.25)		(9.38)	
North-Western	8.810	–10.234		–26.805	
	(9.08)	(25.39)		(48.79)	
Southern	17.841*	10.613		15.092	
	(9.40)	(9.68)		(12.34)	
Ethnic Groups		(≥ 30 %)		(share)	
Bemba		15.466**	13.379**	.184*	.170**
		(7.78)	(5.59)	(.11)	(.08)
Tonga		22.121**	26.443**	.199	.337***
		(9.51)	(11.66)	(.18)	(.13)
North-Western		25.114	10.869	.491	.095
		(26.13)	(8.42)	(.60)	(.08)
Nyanja		–8.670	18.164**	.023	.243***
		(5.43)	(7.30)	(.07)	(.09)
Constant	1.806	–13.881	–22.531	–14.097	–24.471
	(15.65)	(11.98)	(14.97)	(14.76)	(16.83)
N	150	150	150	150	150

Significance levels: * : 10% ** : 5% *** : 1%

Clustered standard errors in parentheses

Table D.34: Presidential vote share and infrastructure construction: 2008 elections, 2010 LCMS

	(1)	(2)	(3)	(4)	(5)
votes MMD	.279**	.404***	.233**	.393***	.264**
	(.11)	(.12)	(.10)	(.14)	(.12)
city	–2.314	2.301	–1.964	3.039	–2.988
	(5.20)	(5.01)	(4.16)	(7.14)	(4.38)
municipal	–8.478***	–6.733**	–6.238*	–5.996*	–6.059*
	(2.58)	(2.81)	(3.27)	(3.32)	(3.42)
access transport	–.038	–.165	.022	–.231	.013
	(.70)	(.57)	(.63)	(.58)	(.68)
access health	–.467	–.534	–.220	–.484	–.313
	(.53)	(.51)	(.49)	(.51)	(.51)
access education	–.930	–.708	–.636	–.766	–.531
	(1.40)	(1.24)	(1.26)	(1.28)	(1.32)
sqrt pop	–.006	–.006	.017	–.010	.009
	(.02)	(.02)	(.02)	(.02)	(.02)
pop density	–.000	.000	.002*	–.001	.003**
	(.00)	(.00)	(.00)	(.00)	(.00)
poverty	.087	.078	–.006	.081	.012
	(.12)	(.11)	(.10)	(.12)	(.10)
km Lusaka			.033***		.029***
			(.01)		(.01)
km Prov. Capital			.011		.012
			(.02)		(.02)
Provinces					
Central	3.413	–4.091		.675	
	(8.81)	(10.09)		(12.28)	
Copperbelt	7.262	–.251		–.294	
	(9.86)	(11.05)		(11.87)	
Eastern	5.754	20.742**		16.850	
	(8.62)	(9.33)		(11.64)	
Luapula	16.521*	12.993		12.572	
	(9.19)	(10.49)		(11.90)	
Lusaka	9.883	25.870**		18.089	
	(12.42)	(12.58)		(14.51)	
Northern	26.463**	27.019***		27.204***	
	(10.17)	(8.95)		(10.01)	
North-Western	9.766	–7.288		–24.166	
	(8.81)	(25.03)		(48.06)	
Southern	15.649*	9.860		17.898	
	(8.89)	(9.83)		(12.61)	
Ethnic Groups		(≥ 30 %)		(share)	
Bemba		14.397*	14.163**	.178	.169**
		(8.24)	(5.63)	(.12)	(.08)
Tonga		18.223*	24.599**	.131	.276**
		(9.28)	(10.41)	(.18)	(.13)
North-Western		23.018	11.802	.474	.107
		(25.70)	(8.22)	(.59)	(.08)
Nyanja		–12.082	11.447*	–.037	.127
		(7.65)	(5.99)	(.09)	(.08)
Constant	3.638	–9.867	–19.396	–11.729	–18.341
	(14.98)	(12.02)	(14.23)	(14.42)	(17.13)
N	150	150	150	150	150

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses

Table D.35: Probit average marginal effects by sector, 2006

	Roads		Health		Education	
votes MMD	.000		.001		.002	
	(.00)		(.00)		(.00)	
40% MMD		.004		.047*		.075**
		(.01)		(.03)		(.03)
Constituency Controls						
municipal	–.001	–.004	–.065**	–.065***	–.016	–.022
	(.02)	(.01)	(.03)	(.02)	(.04)	(.03)
city	–.047***	–.051***	–.078*	–.066	–.055	–.037
	(.02)	(.02)	(.04)	(.04)	(.05)	(.05)
access transport	–.001	–.001				
	(.00)	(.00)				
access health			.002	.002		
			(.00)	(.00)		
access education					.004	.003
					(.00)	(.00)
poverty	.000	.000	.001	.001	.001	.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	–.000	–.000	.000*	.000*	.000*	.000*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop density	.000*	.000**	–.000	–.000	.000	.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls						
poor	–.013**	–.013**	–.017*	–.017*	–.019**	–.019**
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
hh size	–.000	–.000	.002*	.002*	.002	.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
medium scale	.006	.006	.033***	.031**	.030	.027
	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)
large scale	–.000	.000	.076	.078	.021	.026
	(.03)	(.03)	(.05)	(.05)	(.07)	(.07)
non-agric	–.007	–.007	.012	.011	–.008	–.009
	(.00)	(.00)	(.01)	(.01)	(.01)	(.01)
low cost	.039***	.039***	.092***	.092***	.017	.016
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
medium cost	.026	.026	.031	.029	–.047**	–.049**
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
high cost	.026	.026	.054**	.054**	–.038	–.039
	(.02)	(.02)	(.03)	(.03)	(.03)	(.03)
someone ill 2 wks			.022***	.022***		
			(.01)	(.01)		
someone ill yr			.008	.009		
			(.01)	(.01)		
schoolage childr					.006	.007
					(.01)	(.01)
Individual Controls Household Head						
married	.000	.000	–.004	–.004	.014*	.012
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
female	.001	.001	.005	.005	–.002	–.003
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
age	.000	.000	–.000	–.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	–.001	–.001	–.002**	–.002**	–.003**	–.003**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
N	16397	16397	16397	16397	16397	16397

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%

Clustered standard errors in parentheses

Province dummies and language shares included but not reported

Table D.36: Probit average marginal effects by sector, 2006: rural constituencies

	Roads		Health		Education	
votes MMD	–.000		–.001		.000	
	(.00)		(.00)		(.00)	
40% MMD		–.007		.024		.030
		(.01)		(.03)		(.03)
Constituency Controls						
access transport	–.002**	–.002**				
	(.00)	(.00)				
access health			.003	.002		
			(.00)	(.00)		
access education					.006	.005
					(.00)	(.00)
poverty	–.000	–.000	.002	.002	.001	.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	–.000	–.000	.000	.000	.000	.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop density	–.001**	–.001**	–.001	–.001	–.002**	–.002**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls						
poor	–.016**	–.016**	–.024*	–.025*	–.022**	–.022**
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
hh size	–.000	–.000	.004**	.004**	.004*	.004*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
medium scale	.007	.008	.038**	.036**	.026	.024
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
large scale	.012	.011	.137*	.133*	.049	.048
	(.05)	(.04)	(.08)	(.08)	(.09)	(.09)
non-agric	–.008	–.008	.010	.010	–.003	–.004
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
low cost	.047**	.047**	.101***	.101***	.006	.006
	(.02)	(.02)	(.03)	(.03)	(.02)	(.02)
medium cost	.014	.014	.039	.039	–.034	–.035
	(.01)	(.01)	(.04)	(.04)	(.03)	(.03)
high cost	.014	.013	.140**	.136**	.008	.006
	(.02)	(.02)	(.06)	(.06)	(.07)	(.07)
someone ill 2 wks			.027**	.028***		
			(.01)	(.01)		
someone ill yr			.011	.012		
			(.01)	(.02)		
schoolage childr					.010	.010
					(.01)	(.01)
Individual Controls Household Head						
married	.005	.005	–.017	–.017	.006	.005
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
female	.010	.010	.002	.001	.004	.003
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
age	.000*	.000*	–.000	–.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	–.000	–.000	–.001	–.001	–.002	–.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
N	9393	9393	9393	9393	9393	9393

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Clustered standard errors in parentheses

Province dummies and language shares included but not reported

Table D.37: Probit average marginal effects by sector, 2010

	Roads		Health		Education	
votes MMD	.003***		.001		.002**	
	(.00)		(.00)		(.00)	
40% MMD		.030**		.043*		.050*
		(.02)		(.02)		(.03)
Constituency Controls						
municipal	–.001	–.017	–.046**	–.042*	–.068**	–.073**
	(.02)	(.02)	(.02)	(.02)	(.03)	(.03)
city	.021	–.024	–.033	–.018	–.008	–.019
	(.03)	(.03)	(.05)	(.06)	(.06)	(.06)
dist trans	–.000	–.000				
	(.00)	(.00)				
dist health			–.003	–.003		
			(.00)	(.00)		
dist education					.002	.003
					(.01)	(.00)
poverty	–.000	.000	.001*	.001*	.001	.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	–.000	–.000	–.000	–.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop density	.000**	.000	.000	.000	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls						
poor	.012	.013*	.011	.010	.019	.019
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
hh size	.001	.001	.002*	.002*	.005***	.005***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
medium scale	.017*	.021*	–.017	–.017	.001	.003
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
large scale	.060	.072	–.001	–.001	–.004	–.003
	(.05)	(.06)	(.03)	(.04)	(.04)	(.04)
non-agric	–.005	–.004	.000	.001	.013	.014
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
low cost	.043***	.037***	.070***	.069***	.112***	.108***
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
medium cost	.025	.021	.029	.029	.073**	.072**
	(.02)	(.02)	(.03)	(.03)	(.03)	(.03)
high cost	.060**	.052*	.061	.059	.097**	.090**
	(.03)	(.03)	(.04)	(.04)	(.04)	(.04)
someone ill 2 wks			.005	.005		
			(.01)	(.01)		
someone ill yr			.013	.013		
			(.01)	(.01)		
schoolage childr					–.009	–.009
					(.01)	(.01)
Individual Controls Household Head						
married	–.019***	–.019***	.001	.001	–.014	–.013
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
female	–.017***	–.016***	–.007	–.007	–.031***	–.030***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
age	–.000	–.000	–.000***	–.000***	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	.003***	.003***	–.000	–.000	–.003*	–.003*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
N	17420	17420	17327	17327	17420	17420

Significance levels: * : 10% ** : 5% *** : 1%
Clustered standard errors in parentheses
Province dummies and language shares included but not reported

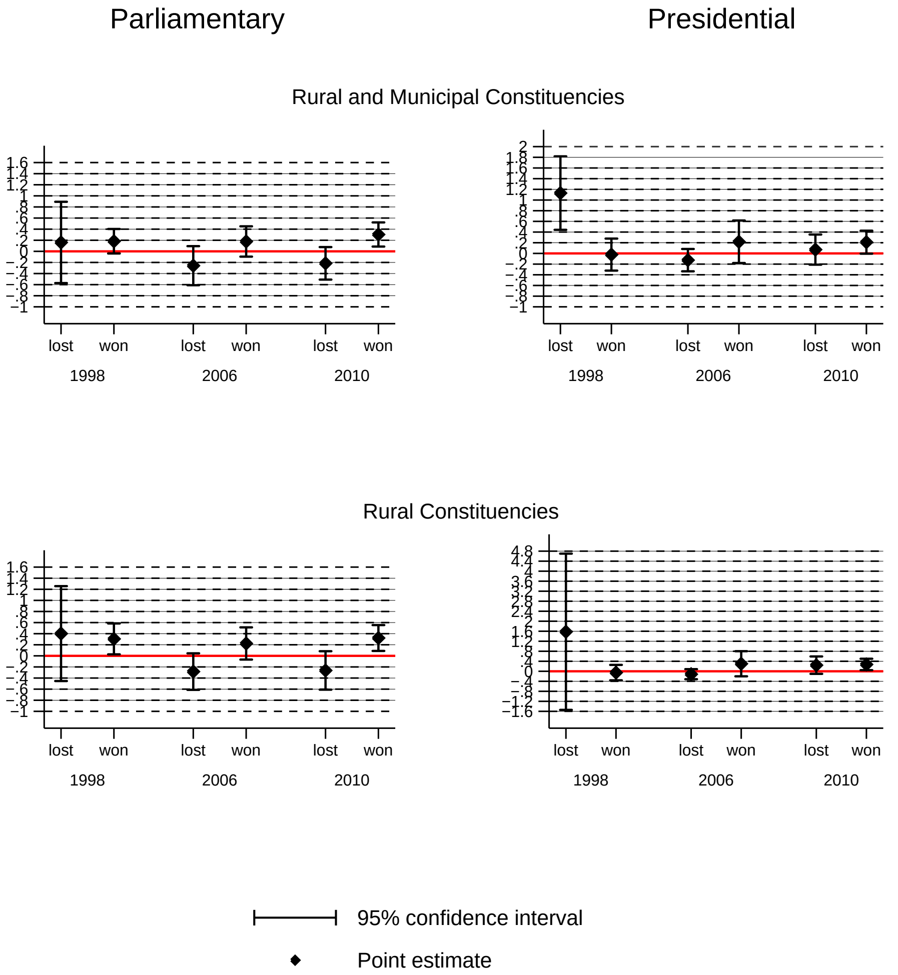
Table D.38: Probit average marginal effects by sector, 2010: rural constituencies

	Roads		Health		Education	
votes MMD	.004***		.002		.003*	
	(.00)		(.00)		(.00)	
40% MMD		.038		.098**		.059
		(.02)		(.05)		(.04)
Constituency Controls						
access transport	–.001	.001				
	(.00)	(.00)				
access health			–.003	–.004		
			(.00)	(.00)		
access education					.006	.006
					(.01)	(.01)
poverty	.000	.000	.002**	.002**	.001	.001
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
sqrt pop	.000	.000**	–.000	–.000	.000	.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
pop dens	–.001	–.001	–.001	–.001	–.003**	–.003**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Household Controls						
poor	.017***	.016**	.024	.022	.034**	.031**
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
hh size	.001	.001	.003**	.004**	.007***	.007***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
medium scale	.012	.013	–.010	–.011	.001	.001
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)
large scale	.077	.056	.032	.026	–.049	–.057
	(.07)	(.06)	(.06)	(.06)	(.05)	(.05)
non-agric	–.010	–.012	.002	.003	.018	.016
	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)
low cost	.055***	.050**	.115***	.112***	.167***	.161***
	(.02)	(.02)	(.03)	(.03)	(.03)	(.03)
medium cost	.026	.025	.070	.072	.148***	.146***
	(.03)	(.03)	(.04)	(.05)	(.05)	(.05)
high cost	.123*	.117*	.178**	.174**	.290***	.282***
	(.06)	(.06)	(.08)	(.08)	(.08)	(.08)
someone ill 2 wks			.003	.003		
			(.01)	(.01)		
someone ill yr			–.002	.000		
			(.02)	(.02)		
schoolage childr					–.008	–.008
					(.01)	(.01)
Individual Controls Household Head						
married	–.022**	–.023**	.003	.002	–.028*	–.029*
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
female	–.018**	–.019**	–.007	–.007	–.044***	–.045***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
age	–.000	–.000	–.001**	–.001**	–.000	–.000
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
years schooling	.003**	.003**	.000	.000	–.003	–.003
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
N	9456	9456	9415	9415	9456	9456

Significance levels: ∗ : 10% ∗∗ : 5% ∗∗∗ : 1%
Clustered standard errors in parentheses
Province dummies and language shares included but not reported

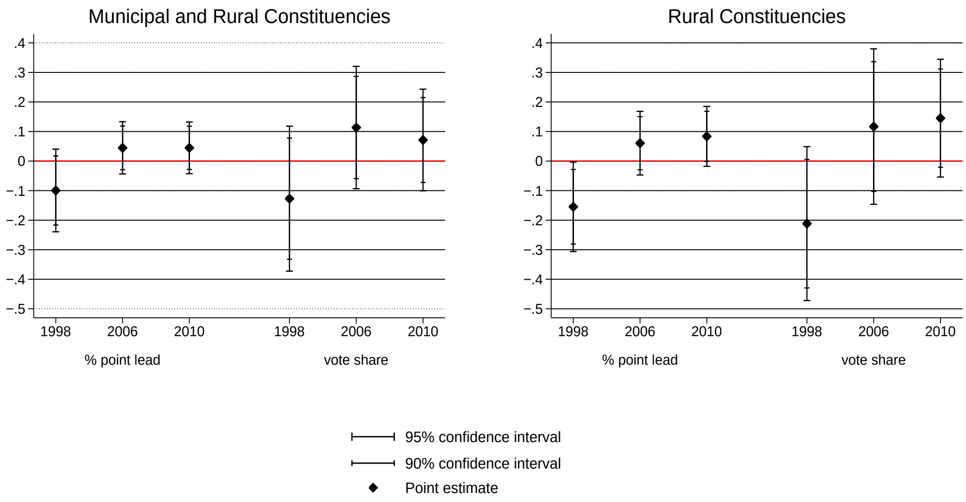
E Marginal effects plots

Figure E.1: Cross-section partial effects of vote margins for rural and municipal constituencies



Source: Author

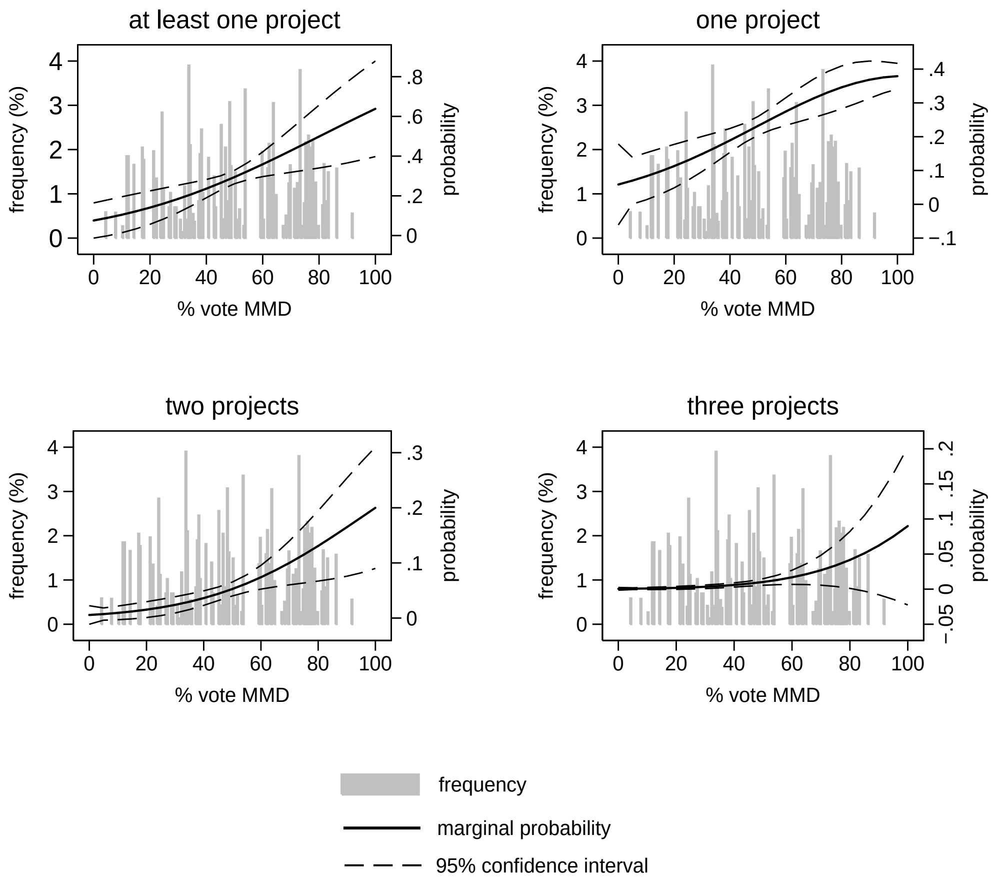
Figure E.2: Panel fixed effects of presidential vote share and % point lead on construction in rural and municipal constituencies



Source: Author

F Marginal probability plots

Figure F.1: Marginal probability of households reporting construction in 2010 (at sample means), rural constituencies



Source: Author

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