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Original Paper

How Does Politics Affect Quality of Public Transport Infrastructure?

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Abstract

While prior studies have investigated the impacts of political factors such as the ideological stance on quality of public infrastructure, there is a paucity of research on the political effects of re-election success, party fragmentation (political power), and the formation of new electoral consistency on quality of public transport infrastructure, which is represented in this paper by road maintenance efficiency. We employ an instrumental variable approach to mitigate a potential reverse causality bias inherent in literature. Our empirical results show that local governments whose political representatives were re-elected give rise to lower road maintenance efficiency. Local governments with new electoral constituencies report a higher road maintenance efficiency.

Keywords

Politics, Public Infrastructure, Efficiency, Road Maintenance, Re-election, Electoral constituency, Party Fragmentation, Uganda

1. Introduction

Efficiency in public infrastructure is often assessed from two different perspectives: the first pertains to a general or macroeconomic view and the second relates to a particular service (Narbón-Perpiñá and De Witte 2018a). Public transport infrastructure efficiency is influenced by a few multi-faceted factors, of which politics is of paramount importance. This paper examines the political effects of re-election (RE), party fragmentation (PF) and electoral constituency (EC) on public transport infrastructure efficiency, which is represented in this paper by road maintenance efficiency (RME).

Previous studies explored for instance how re-election (or probability of incumbent politicians being re-elected) impacted on public road maintenance from macroeconomic viewpoint (Devarajan and Reinikka 2003; Hasnain 2010; Haughwout 2002). While there is a strong evidence of the effects of trust

(Buch-Gómez and Cabaleiro-Casal 2019) and electoral accountability or voter turnout (De Kadt and Lieberman, 2017; Helland and Sørensen 2015; Revelli and Tovmo 2007) on public transport efficiency, there is paucity of research on how re-election affects the RME (see also D'Inverno, Carosi, and Ravagli 2018; and Hlepas 2010) .

Previous studies have also examined the roles played by political factors such as party fragmentation (PF) (Borge, Falch, and Tovmo, 2008) and political strength (Da Cruz and Marques 2014; Doumpos and Cohen 2014; Geys, Heinemann, and Kalb 2010; Helland and Sørensen 2015). While Sørensen (2014) found that the absence of political competition led to a reduction in general RME, Doumpos and Cohen (2014) found a positive association between RME and lower level of political opposition. The mixed findings could be due to the differences in the measurement of political variables, which is further associated with differences in administrative systems (Doumpos and Cohen, 2014; Narbón-Perpiñá and De Witte, 2018a) . The conflicting results suggest the need for further research on the role of PF (political power concentration) on RME.

Furthermore, we examine the role of electoral constituency (EC), especially in relation to the formation of new electoral constituencies, on RME. A new EC arises from the formation of a new local government, which is a common occurrence in many developing countries (Green 2010). Despite the potential importance of the effect of EC on RME, amid low government budgets and the need to use public funds more efficiently, the literature is thin on this causal relation.

The paper is organized as follows. Section 2 theorizes the links between politics and public infrastructure efficiency. Section 3 offers an institutional setting and provides measurements of the key variables in that setting. Section 4 presents the models and our identification techniques. We use the Ugandan data for our regression analysis. The data sources are presented in Section 4. The analysis, empirical results, discussion and conclusions are presented in sections 5, 6 and 7 respectively.

2. Literature Review and Hypothesis Development

2.1 Re-election of Political Representatives (RE)

The tendency of politicians is to get party majority or dominance (or less fragmentation), and to be re-elected. Politicians who focus on efficient public spending would need to improve their political capital. While individual rewards to voters provide substantial private political capital (Mwenda 2007), prudent public expenditures on road construction and maintenance provide immense public political capital, more than public expenditures on health and education (Devarajan and Reinikka 2003; Hasnain 2010) (Note 1).

Prior research is unclear as to whether voters hold the politicians accountable and if the politicians always respond to this expectation. For instance, in Pakistan's local government elections, incumbency advantage was not related to citizen's utility on public transport the services but rather depends on a few hundred union councilors. While acknowledging the importance of electoral accountability and

hence the likelihood of re-election, improved public infrastructure was credited to the other factors seemingly unrelated to accountability (Hasnain 2010).

In some cases, incumbents in the service improving districts are less likely to run but are highly probable to run and win than incumbents in low performing districts and in other cases, the reverse is possible in Indonesia (Lewis, Nguyen, and Hendrawan 2020), further suggesting mixed findings in the literature. Therefore, previous studies take neither accountability nor re-election into consideration in explaining why re-election might affect public infrastructure quality. Yet, when voters' expectation align with politicians' accountability (including their sense of responsibility to spend wisely on road maintenance), politicians would be more likely to provide better road maintenance services to the public (see also Giordano and Tommasino 2013).

We posit that politicians with higher probability of being re-elected would be more prudent or accountable in spending public money on public infrastructure improvement. We also hypothesize that MPs who are highly likely to be re-elected would likely to spend more on road maintenance because they are pretty sure of having a second take at running the office in order to enhance their political capital (Da Cruz and Marques 2014; D'Inverno et al. 2018; Doumpos and Cohen 2014).

A re-elected administration may also be less inclined to ensure quality of public infrastructure, especially if that was the last chance for them at office (Doumpos and Cohen 2014; Hlepas 2010; D'Inverno et al. 2018). Such is what was conjectured by Lewis et al. (2020) about Indonesian second term mayors whose public service performance was found unrewarding to their voters. Hence:

Hypothesis 1: Citizens whose local government's political representatives command higher chances of reelection success are likely to report lower road maintenance efficiency than those that have not been reelected.

There are instances where literature examined the effect of the incidence of incumbency advantage on general service provision. In Southern Africa, the incumbent party was found to have performed poorly in areas that register improvements in public service delivery. This seems to suggest that target spending by governments did not always lead to greater electoral performance or re-election. Moreover, theories of electoral accountability do not hold in Southern Africa based on this evidence (De Kadt and Lieberman 2017). As a result, hypothesis 1 above may not always be true. More empirical tests are necessary to examine the relationship between re-election success and RME. There is also a need to mitigate the potential reverse causality bias as implied in the literature.

2.2 Party Fragmentation (PF)

A study on public efficiency in Norway finds that the political party share of the election outcome has the effect on government efficiency (Sørensen 2014). An implication of this on our paper is that a rise in the incumbent's vote share over a period within the same economic region leads to greater political dominance, which then gives rise to a decline in efficiency of public infrastructure, as competition across political entities is diminished. This reduction remains even when electoral volatility ("*defined*

as variations in voter support for a bloc that are unrelated to voter's assessment of the incumbent's efficiency) was held at its mean (Helland and Sørensen 2015, 122).

A party with majority vote and hence political dominance is likely to increase administrative spending (Sjahrir, Kis-Kasos, and Schulze 2014) rather than public service spending, mainly to benefit themselves more than the others. The self-interests of a political dominant group may then lower public infrastructure spending such as road servicing. Conversely, the presence of party competition or higher degree of PF would lead to reduction in administrative overspending, and consequentially to better quality of public infrastructure.

Another paper shows that the introduction of direct elections does assist the local governments in having better spending behavior in Indonesia (Sjahrir, Kis-Kasos, and Schulze 2014). This is probably because cross-party competition is raised. A higher voter turnout and involvement could also lead to better government efficiency especially if such a government depends on own funds and not on external funds (Geys, Heinemann, and Kalb 2010). However, the ruling dominant political party is likely to depend more on internal government funding as external funds are hard to be procured and there is less pressure to look for funding from overseas due to the lack of cross-party competition/lobbying. We therefore predict that:

Hypothesis 2: Where the incumbent or ruling party is the only or majority party (with high political power concentration), road maintenance is likely to be less efficient. That is, PF or existence of more competing parties raises RME.

2.3 Electoral (Geographical) Constituency

The phenomenon of creating new electoral constituencies synchronizes strongly with that of gerrymandering Our measure collaborates research on the effect of the proliferation of administrative units on public transport infrastructure that is common in several developing countries such as Brazil, the Czech Republic, Ghana, Hungary, Nigeria, Pakistan, Uganda, and Vietnam, among others (Grossman, Pierskalla, and Boswell Dean 2017). As a means of enlarging the influence of the incumbent party through securing of votes, gerrymandering has been used as a tactic (Malesky 2009). When newer constituencies are being funded, RME may increase. It is possible that new constituency leaders are more zealous in their jobs and are likely to prove their job abilities by raising public infrastructure quality. Therefore:

Hypothesis 3: Citizens whose local governments have new electoral constituencies (with new leaders for instance) are likely to report higher RME.

3. Measurements of Variables

3.1 Road Maintenance Efficiency (RME)

Efficiency has been measured in several ways. Some prior papers used revenue including tax, subsidies and grants for developing an efficiency index (Borge et al. 2008; Bruns, and Himmler 2011) while others consider the cost (Pérez-López, Prior, and Zafra-Gómez 2015) and public sector efficiency scores, as in Giordano and Tommasino (2013). Efficiency as it relates to a particular service has taken different forms such as number of books and total number of opening hours per week as alternates for library service potential and accessibility of library collection respectively (De Witte and Greys 2011).

Road maintenance is the only service in Uganda that is directly implemented by local governments. Unlike other services that may use third party providers, road maintenance requires not just monitoring and supervision by local government officials but direct implementation through force account, which means that funds are allocated from a central pool to local governments to maintain roads either by contractors or the use of government road equipment. In this paper, we measure RME by accessibility of the roads. The distance to the district headquarters (DHQ) is considered as a variable (Note 2). We hypothesized that the longer the distance (5km and more) to the district headquarters, the worse the road maintenance. This constitutes a proxy of road maintenance in achieving accessibility. A longer DHQ could suggest an increase in maintenance costs (Radulović and Dragutinović 2015; Sjahrir, Kis-Kasos, and Schulze 2014; Šťastná and Gregor 2015). Notwithstanding, distance to the administration center has proxied population sparseness in determining service efficiency (Revelli and Tovmo 2007). A key feature of the location of the district headquarters is that majority of these districts are located far from any town or village, and yet principally they are meant to be in the middle, geographically. This means that district officials commute long distances over gravel roads (Green 2010), which may subsequently exert a negative effect on efficiency. Nonetheless, an improved or well-maintained road may imply that such distances become shorter for both district officials and the beneficiaries of the service delivery.

We test the robustness of the distance measure by using a variable that gauges if the roads being maintained had become worse, same or improved in the last two years. This is a direct RME construct.

3.2 Re-Election (RE)

Another interesting feature of Ugandan Member of Parliament (MP) Elections is the high frequency/occurrence of re-election. The need to stay in office even after serving for a singular term is primarily driven by the desire to hold on to power by the President of Uganda. Put differently, analysts have inferred a likely correlation between the removal of terms and recent re-election occurrences. A larger parliament in Uganda's case is advantageous to the president as he uses it for his own selfish gain. Moreover, the absence of term limits on the position of the president consequentially exacerbates MPs' desire to stay in power. Arguably, elections are expensive for most MPs because they are forced to spend beyond their means (Izama and Wilkerson 2011; Mwenda 2007) and therefore would want to be re-elected to recoup from their initial investment.

To this end, we adopted another political measure that has been used in local efficiency studies that have inculcated environmental determinants (Narbón-Perpiñá and De Witte, 2018b). Prior studies also reflect a direct re-election measure (Da Cruz and Marques 2014; D'Inverno et al. 2018; Doumpos and Cohen 2014) and an indirect measure. The indirect measure of re-election has been discussed as the years left to the end of the electoral term (Agasisti, T. Dal Bianco, Antonio and Lombardia 2015). With this measure, we hypothesize that re-elected MPs would lead to higher efficiency due to learning by doing as they are having a second take at running office, i.e. become familiar with and better at their jobs (Da Cruz and Marques 2014; D'Inverno et al. 2018; Doumpos and Cohen 2014).

3.3 Party Fragmentation (PF)

Although Uganda has had one political party in the position of the president, there is political party competition at the lower electoral echelons especially at parliamentary level (Note 3). This kind of political system has been referred to as a "multiparty autocracy" (Blattman, Emeriau, and Fiala 2018). Electoral term limit in Uganda is five years, where one representative or flag bearer per political party can participate at each electoral level. At state level, the country has witnessed leadership from the National Resistance Movement for the last 33 years. The opposition parties occupy only 12 percent of the vote share, although it has recently increased to a quarter (Blattman et al., 2018). The opposition parties occupy 31 percent of 289 places of directly elected MPs of the 10th parliament. This number (289 places) excludes other types of MPs such as Women MPs, and special group representatives.

Therefore, in the construction of this research's key independent variables, MPs directly elected, i.e. those whose positions do not arise out of affirmative actions as with special group representatives was considered. We considered directly elected MPs for ease of amalgamation from constituencies (which is the level at which each MP is elected) to local governments. Each local government is composed of more than one constituency. Therefore, the inclusion of women and special group representatives would have countered our argument that seeks to leverage political strength, which is best suited with or depicted by MPs.

More so, MPs were selected because of the role they play in road maintenance. According to the Road fund act, a district roads committee kick starts the process of road maintenance in Uganda. Its mandate is to plan, approve work plans, budget for, and monitor road works (Government of Uganda 2008). This committee is comprised of all local government political leaders, Local government administrative officials, and the district and or municipal engineer (Note 4). Of interest is a discovery made through stakeholder interviews of fights emanating from MPs, where each desires to push his or her own stakes (Note 5). Retrospectively, an MP with lobbying and negotiation skills can ensure better efficiency in his constituency. These skills are subjected to coalition subscription; either the ruling/incumbent party or the opposition. Based on this discovery, we associated the role that party affiliation plays in negotiating low budgets, which in the first case leads to fights.

Therefore, prior studies that have studied PF or lack of political strength due to competition were followed closely in measuring PF in this study. While studies that have used the Herfindahl index were acknowledged (Ashworth, Geys, Heyndels & Wille, 2014; Borge et al., 2008; Geys et al., 2010; Helland & Sørensen, 2015; Kalb, 2014; Revelli & Tovmo, 2007), those that have not used this index were more pertinent to this study. Prior measures of interest were the number of coalition parties and coalition politics (Ashworth et al., 2014; De Borger, Kerstens, Moesen & Vanneste, 1994; Vukovic, 2017). Albeit different in exact formation, prior measures were used to proxy the degree to competition and coalition strength. For instance, Ashworth et al. (2014) termed one of the variables as "single-party government" and "number of coalition parties". It is against this background that we hypothesized that where the ruling party is the majority, such a local government will experience higher RME.

3.4 Electoral/Geographical Constituency (EC)

Another important feature of Uganda is the creation of districts. The number of districts has been increasing from 30 in 1990 to 80 in 2010 (Green, 2010). While the number at present stands at 134 (as of 2020), there is no certainty that it will remain at this level. Green (2010) argues that the creation of new districts is motivated by patronage; put differently, a means of creating jobs in order to be re-elected. The creation of new districts often calls for the creation of new constituencies (Note 6). Newer constituencies require more funds than older ones, hence they are likely to report efficient public transportation services.

4. Models and Data

To avoid underestimating standard errors of regression coefficients, a clustering framework through multilevel approaches selected (Rasbash et al., 2000). It is a preferred method because it can solve biases arising from aggregation, heterogeneity and parameter estimation errors (Maxwell, Reynolds, Lee, Subasic & Bromhead, 2017).

4.1 The Distance Measure-A Continuous Variable

$$y_{ij} = a_j + bx_{ij} + e_{ij} \quad (1)$$

A single level in equation one is first estimated where y_{ij} represents our indirect efficiency measure which is a continuous dependent variable in household *i* and district *j*. Term a_j varies across districts and remains the same at household. Term bx_{ij} represents covariates at both the household and district, where the term has only one subscript then it is representative at that level; and remains the same for the other level for which the subscript is absent. The covariates are RE, PF and EC, among others explanatory variables. The term e_{ij} stands for the intercept of the dependent variable y_{ij} and determines if there are differences between districts in the population mean of y_{ij}. If such differences are established, a random effect also known as the variance components model is estimated and given as:

$$y_{ij} = a + bx_{ij} + u_j + e_{ij} \quad (2)$$

which is broken down into the following equations:

$$y_{ij} = \beta_{0j} + \varepsilon_{ij} \quad (3)$$

$$\beta_{0j} = \beta_0 + \mu_{0j} \quad (4)$$

$$\mu_{0j} \sim N(0, \sigma_{\mu 0}^2) \quad (5)$$

$$\varepsilon_{ij} \sim N(0, \sigma_{\varepsilon}^2) \quad (6)$$

Whereby equations 5 and 6 represent the random effect. $\sigma_{\mu 0}^2$ and σ_{ε}^2 are the random parameters while the fixed parameters are a and b given in equation (1).

4.2 Alternative Efficiency Measure-An Ordered Multinomial Variable

For an ordered multinomial, it is specified that the original dependent variable has *c* categories indexed by *k* (*k*=1, ….*c*) and the reference category is *c*. Suppose that the probability of household *i* having a dependent variable value of *k* is $\pi_i^{(k)}$. To take advantage of the ordering, the model is based upon the cumulative response probabilities instead of response probabilities for each separate category. Hence, the cumulative response probabilities are defined as:

$$E(y_i^{(k)}) = \gamma_i^{(k)} = \sum_{h=1}^{k} \pi_i^{(h)}, k = 1, \ldots, c-1 \quad (7)$$

In equation 7, $y_i^{(k)}$ are the cumulative proportions are observed for the *i* household. Expressing the category probabilities in terms of the cumulative probabilities, we have:

$$\pi_i^h = \gamma_i^{(h)} - \gamma_i^{(h-1)}, 1 < h < t$$
$$\pi_i^{(1)} = \gamma_i^{(1)}; \gamma_i^{(c)} = 1 \quad (8)$$

A proportional odds model with a logit link is selected and written as:

$$\gamma_i^k = \{1 + exp - [\alpha^{(k)} + (X\beta)_i]\}^{-1}$$

$$or$$

$$logit(\gamma_i^k) = \alpha^{(k)} + (X\beta)_i \quad (9)$$

Equation 9 implies that increasing values of the linear component are associated with increasing probabilities as *k* increases (Rasbash et al., 2000).

Since our model assumes a multinomial distribution for the categorical probabilities, the cumulative proportions have a covariance matrix given by:

$$cov(y_i^k, y_i^r) = \frac{\gamma_i^k(1-\gamma_i^{(r)})}{n_i}, k \le r \quad (10)$$

The ultimate model is a two-level category response model, which is a generalization of the single-level model given in equations (7) to (10). It is shown in the following set of corresponding model equations:

$$E(y_{ij}^{(k)}) = \gamma_{ij}^{(k)} = \sum_{h=1}^{k} \pi_{ij}^{(h)}, \quad k = 1, \ldots, c-1$$

$$cov(y_{ij}^{(k)}, y_{ij}^{(r)}) = \frac{\gamma_{ij}^{(k)}(1-\gamma_{ij}^{(r)})}{n_{ij}}, \quad k \le r$$

$$\gamma_{ij}^{(k)} = \{1 + exp - [\alpha^{(k)} + (X\beta)_{ij} + Z_{ij}u_j]\}^{-1} \quad (11)$$

Or

$$logit\left(\gamma_{ij}^{(k)}\right) = \alpha^{(k)} + (X\beta)_{ij} + Z_{ij}u_j$$
$$\pi_{ij}^{h} = \gamma_{ij}^{h} - \gamma_{ij}^{h-1}, \qquad 1 < h < c$$
$$\pi_{ij}^{(1)} = \gamma_{ij}^{(1)}; \gamma_i j^{(c)} = 1$$

4.3 Data

The data for the parametric methods relied on Uganda National Service Delivery Survey (NSDS); conducted in 2015. The NSDS is a household survey dataset that provides an assessment of trends in service delivery in various sectors, including road infrastructure, public sector management, and accountability and projects implemented. The survey follows a two-stage stratified sampling design, i.e., first stage at enumeration level and second stage at household level (10,200 households were sampled) (UBOS, 2015).

Within the NSDS 2015, modules investigating access to road infrastructure and state of roads were selected for this study. The indirect measure of RME was represented by a variable that asked for the distance from the household to the district headquarters. The high skewness and kurtosis of this variable compelled transformation to the square root. The direct measure of RME was represented by a variable that asked for the condition of the household's nearest road and required selection of the following responses: improved; remained the same; worsened; do not know. Observations that responded to the "don't know" category were dropped. A key control variable from this module is the *type of road nearest to the household* (RNH), captured as a categorical variable with the following responses: 1=Paved, 2=Gravel, 3=Feeder, 4=Community Access. Another considered covariate was *how to access the nearest road* (ANR). This variable was originally categorical with the following responses: 1=Walking, 2=Bicycle, 3=Motorcycle, 4=Boat, 5=other. These responses were collapsed to an indicator variable with 1=Walking (as most respondents selected this option) and 0=other (combining responses from 2 to 5). We selected the *distance to the nearest transport* (DNT) point in kilometers and transformed it square root to meet the normality test. We controlled for the *expense to the nearest transport point* (ENT), a binary variable. We expected that changes in these household level control variables determined the level of efficiency. For instance, we expected a negative relationship between the DNT with our dependent variable.

Modules discussing disaster management and tourism were selected from the district questionnaire following prior works that found LGs with more tourist attractions are associated with changes in service efficiency. Although *a priori* evidence has been established regarding tourism (hereafter as TD), it remains mixed (Giménez & Prior, 2007; Pérez-López, Prior & Zafra-Gómez, 2015). This is because it is an investment requiring a cost, which can alternatively be used to improve services in local governments.

Regarding the selection of variables related to population size and growth, we followed studies that find higher population particularly a higher immigration rate is associated with higher efficiency because it increases the population and service expenditure in the short term (Lampe, Hilgers & Ihl, 2015). Hence, variables capturing the presence of refugees (PR) and displaced persons (PDP) as a

proxy to the migration rate were included in the analysis. While an influx of refugees has had a strain on service delivery in Uganda (VNG International 2018), improved efficiency resulting from committed donor funds (Muhenda, 2018) is likely suggesting a probable mixed association.

Other variables capturing the population growth and size include District Migration (DM), seasonal (SM) and Massive Migration (MM). These variables were sourced from the Uganda National Household Survey (UNHS) collected in 2016/17. Specifically, the community module investigates migration information at community level, but variables of interest were created by collapsing at the district level. Although data was collapsed to 122 local governments, information on 111 districts was relied upon to collate with other sources (Note 7). District, seasonal and massive migration were also proxying for the percentage of foreign inhabitants which has been found to decrease efficiency and is explained from the standpoint of the inability to vote or less interest in politics (Bosch, Espasa & Mora, 2012; Bruns & Himmler, 2011). Therefore, migration variables are surrogates for population size and growth as well as the immigration share.

We obtained information on politics from the Electoral Commission (EC) and compiled a list of winners every election year. The list included the district, constituency, the winner, and the political party affiliation. We created the variable representing re-election by matching the 2006 and 2011 electoral years. If an MP was re-elected in 2011, we marked that constituency with one. Ultimately, we collapsed into districts, forming a binary variable with one indicating one or more of the district's constituencies had a re-elected MP and zero otherwise. The constituencies that could not be categorized for the re-election variable were marked as new in 2011. Hence, a variable on the new EC was formed from such constituencies. Districts that had a new constituency were marked with one and those without-zero. The variable representing political party fragmentation was a binary indicating one if the district was predominantly of the incumbent party (the NRM) and zero if the district's political PF is mixed (Note 8).

After merging and data cleaning, we remained with a working sample of 8,369 observations. Table 1a presents a summary, i.e., symbol, transformations, expected of selected variables. In Table 1b, we present descriptive statistics for all variables that are used in the main estimation. The means distance to district HQ (4.34) is close to what is recommended (5km) (Green, 2010).

Table 1a. Description of Variables, Data Sources and Expected Coefficient Sign

Variable	Symbol	Source	Description	Expected sign
Dependent variable				
Distance to district HQ	DHQ	NSDS2015-household module	Continuous variable in kms, transformed into square root	

Maintenance of roads in last years	MYR	NSDS2015-household module	Categorical variable	
Independent variables				
Household covariates				
Type of road near household	RNH	NSDS2015-household module	Categorical variable	Negative
How to get to nearest road	ANR	NSDS2015-household module	Dummy variable equal to 1 if household walks, 0 otherwise	Negative
Expense to nearest transport	ENT	NSDS2015-household module	Binary variable	Negative
Distance to nearest transport	DNT	NSDS2015-household module	Continuous variable in kms-transformed into square root	Negative
District covariates				
Re-election	RE	EC2006-2011	Binary variable	Negative
Party fragmentation	PF	EC2011	Binary variable	Negative
Electoral constituency	EC	EC2006-2011	Binary variable	Positive
Presence of displaced persons	PDP	NSDS2015-district module	Dummy variable equals to 1 if district has displaced persons, 0 otherwise	Negative
Presence of refugees	PR	NSDS2015-district module	Dummy variable equals to 1 if district has refugees, 0 otherwise	Negative
Tourist district	TD	NSDS2015-district module	Dummy variable equals to 1 if a tourist district, 0 otherwise	Positive
District migration	DM	UNHS2016/17	Dummy variable equal to 1 if people move out of district temporarily for work, 0 otherwise	Negative
Seasonal migration	SM	UNHS2016/17	Dummy variable equal to 1 if people move to the	Positive

			district temporarily for work, 0 otherwise.	
Massive migration	MM	UNHS2016/17	Categorical variable	Negative

Source: Author's computation based on NSDS (2015), EC (2006-2011), UNHS (2016/17).

Table 1b. Descriptive Statistics of the Effect of Re-Election, New Electoral Constituency and Party Fragmentation on Road Maintenance in the Last 2 Years and Distance to District Headquarters

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variable					
DHQ	8,369	4.34	1.82	0	9.99
MRY [a]	8,369	1.85	0.73	1	3
RNH [b]	8,369	3.44	0.82	1	4
ANR[c]	8,369	0.99	0.11	0	1
ENT	8,369	1.75	0.43	1	2
DNT	8,369	1.3	0.97	0	9.22
District covariates					
Re-election	8,369	0.88	0.83	0	1
PF[d]	8,369	0.55	0.5	0	1
EC	8,369	0.29	0.45	0	1
PDP	8,369	1.69	0.46	1	2
PR	8,369	1.74	0.44	1	2
TD	8,369	1.1	0.29	1	2
DM	8,369	1.35	0.48	1	2
SM	8,369	1.47	0.5	1	2
MM [e]	8,369	2.86	0.87	1	4

Notes. [a] 1=Improved, 2=same, 3=Worsened; [b] 1=Paved, 2=Gravel, 3=Feeder, 4=Community Access; [c] 0=other, 1=Walking; [d] 1 =NRM only, 2 =Mixed party; [e] 1=moved in, 2=Moved out, 3=about the same of both, 4=neither arrivals nor departures. Source: Author's computation based on NSDS, (2015), EC (2011), UNHS (2016/17).

5. Estimation Results

5.1 Continuous Dependent Variable-An Indirect RME Measure

The analysis was carried out in four steps using MLwiN software. In the first and second stages, a null single level model and a null multilevel model respectively were estimated. The multilevel model hereby called random intercept model means that the constant can vary at the district level. The aim of the first two models was to establish the presence of district effects. A likelihood test was used to compare null models especially where the first model is thought to be restrictive (Rasbash et al., 2000). In the third and fourth stages, single, two and three level models and random intercept models respectively were built, whilst increasing in complexity and potential as more predictor variables were added. To avoid multi-collinearity, separate models for each of the key independent variables (re-election, party fragmentation and new electoral constituency) were estimated. The fourth stage entailed the building of the estimation using the Markov Chain Monte Carlo (MCMC) Bayesian method that has been found to perform superior to the maximum likelihood technique (Alonso, Andrews, Clifton & Diaz-Fuentes, 2019).

The results are interpreted as significant if the standard score or z-scores of the beta coefficients meet the thresholds. The log likelihood in the null single and the null intercept random models of Table 2 reflect the presence of district effects in our dependent variable, thereby necessitating the use of multilevel modeling.

Table 2 also presents results for the association between *re-election* and DHQ. The coefficient is positive and significant at 10 percent level in the single level model but insignificant in the random intercept model. The probability that local governments with re-elected leaders report increased distance to district HQ is 8 percent higher, which signals reduced efficiency. Other explanatory variables are significant in both models except for ANR and TD, differences in the two models notwithstanding.

Table 3 indicates that the coefficient for EC is significant at 1 percent level and is positive in the single level model and insignificant in the random intercept model. New constituencies have 13-percent lesser probability of reporting longer distances, which purports to improved road maintenance. Take note that RME measure here is an indirect one, with shorter distances signifying better road maintenance service. The pattern of significance and insignificance of other control variables are similar to Table 2's. Only two district level explanatory variables remain significant in the random intercept model, i.e., SM and PR. Significant coefficients tend to reduce in magnitude in the random intercept model.

Table 3 also presents results for PF and DHQ. The PF coefficient is negative and significant at 1 percent level in the single level, and insignificant in the random model. The presence of the incumbent party as the dominant party is associated with 13 percent lower probability of reporting longer distances, which beckons better indirect efficiency. A largely similar pattern of other significant controls as in RE and EC models is observed. In addition, a change in the sign of DNT and a reduction in significance of migration variables from 5 to 10 percent level is noticed with the random intercept model.

The uniformity in significance of other explanatory variables in Tables 2 and 3 calls for collective explanation. The RNH is positive and significant at 1 percent. Except in models related to PF, the DNT is positively associated with longer DHQ while the ENT depicts a negative association. In some studies, DNT and ENT have stood in for wear and tear (Blom-Hansen, 2003; Petersen & Houlberg, 2016). District explanatory variables are proxies for the population density. Migration variables are associated with shorter DHQ. The PDP meets expectations while PF is associated with longer distances. Areas with displaced persons and or refugees have been associated with poor service delivery irrespective of donor support towards service efficiency (Muhenda, 2018). Coefficients in MM are significant in the single level model and demonstrate a positive relationship but is insignificant in the random intercept model.

Several district level variables are insignificant in the random intercept model. Insignificant district level variables at the random intercept model could be explained from an insight that says that single level or marginal models could produce unbiased results, hence treating random parameters as a nuisance (Goldstein, 2003). It is probable that there is no variation given that the district is the highest aggregated level. The same models were built by adding level three units, i.e., sub regional level, however the key dependent variables remained insignificant (Note 9). Random intercept models of Tables 2 and 3 indicate that the models explain 56 percent of the variance in the main dependent variable.

Table 2. Results of the Indirect Measure with Re-Election

	Null single model		**Null random intercept model**		**Single-level model**		**Random intercept model**	
	beta	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**
Intercept of DHQ	4.337***	0.02	4.251***	0.083	3.17***	0.23	3.53***	0.46
RNH (ref=Paved)								
Trunk					0.70***	0.12	0.45***	0.11
Feeder					0.55***	0.10	0.37***	0.10
Community					0.67***	0.10	0.40***	0.09
ANR (ref=Other)					-0.21	0.18	-0.16	0.17
DNT					0.39***	0.02	0.38***	0.02
ENT (ref=no)					-0.20***	0.05	-0.10	0.05
District level variables								
Re-election (ref=Not re-elected)					0.08+	0.04	0.19	0.18
DM (ref=No)					-0.20***	0.05	-0.21	0.17
SM (ref=No)					-0.38***	0.05	-0.31+	0.17
PDP (ref=No)					-0.23***	0.05	-0.17	0.18

TD (ref=No)					0.07	0.07	-0.13	0.25
PR (ref=No)					0.68***	0.05	0.65***	0.20
MM (ref= More moved in)								
More moved out					0.34***	0.10	0.15	0.36
About the same of both					0.47***	0.10	0.31	0.36
Neither arrivals nor departures					0.34***	0.10	0.15	0.37
Residuals	3.302	0.051	2.66	0.041	3.05	0.05	2.55	0.04
District effects			0.691	0.101			0.56	0.08
2*log likelihood	33746.55		32245.848		33088.48		31862.59	
Households	8369		8369		8369		8369	
Districts			106				106	

Note. Z-scores (beta/std err) 1.28-1.96 (+), 1.96-2.32 (*), 2.33-2.5 (**), 2.5> (***).

Table 3. Results of the Indirect Measure with New Constituency and Party Fragmentation

	Single-level model		**Random intercept model**		**Single-level model**		**Random intercept model**	
	beta	Std.Err	beta	Std.Err	beta	Std.Err	beta	Std.Err
Intercept of DHQ	3.21***	0.23	3.52***	0.47	3.22***	0.23	3.50***	0.47
RNY (ref=Paved)								
Trunk	0.70***	0.12	0.45***	0.11	0.72***	0.12	0.45***	0.11
Feeder	0.55***	0.10	0.37***	0.10	0.55***	0.10	0.37***	0.10
Community	0.67***	0.10	0.40***	0.09	0.67***	0.10	0.40***	0.09
ANR (ref=Other)	-0.22	0.18	-0.16	0.17	-0.22	0.18	-0.16	0.17
DNT	0.39***	0.02	0.38***	0.02	-0.39***	0.02	0.38***	0.02
ENT (ref=no)	-0.21***	0.05	-0.10+	0.05	-0.22***	0.05	-0.10+	0.05
District level variables								
EC (ref= yes)	-0.13***	0.04	-0.05	0.16				
PF (ref=Mixed)					-0.12***	0.04	0.00	0.16
DM(ref=No)	-0.18***	0.05	-0.22	0.18	-0.24***	0.05	-0.23+	0.18
SM (ref=No)	-0.37***	0.05	-0.32+	0.18	-0.37***	0.05	-0.32+	0.18
PDP (ref=No)	-0.23***	0.05	-0.19	0.18	-0.24***	0.05	-0.19	0.18
TD(ref=No)	0.08	0.07	-0.08	0.24	0.11	0.07	-0.08	0.24
PR (ref=No)	0.66***	0.05	0.64***	0.21	0.69***	0.05	0.66***	0.20

MM (ref= More moved in)								
More moved out	0.34***	0.10	0.21	0.36	0.46***	0.10	0.22	0.36
About the same of both	0.47***	0.10	0.35	0.36	0.35***	0.10	0.36	0.36
Neither arrivals nor departures	0.37***	0.10	0.21	0.37	0.35***	0.10	0.21	0.37
Residuals	3.05	0.05	2.55	0.04	3.05	0.05	2.55	0.04
District effects			0.56	0.08			0.56	0.08
2*log likelihood	33082.65		31863.00		33082.71		31863.77	
Households	8369		8369		8369		8369	
Districts			106				106	

Note. Z-scores (beta/std err) 1.28-1.96 (+), 1.96-2.32 (*), 2.33-2.5 (**), 2.5> (***).

5.2 Ordinal Dependent Variable-A Direct Variable of RME

To analyze the effect of RE, new EC and PF on the alternative efficiency measure, five stages were carried out. In the first and second stage, a null single level ordered multinomial model of a logit link, and a null two-level model respectively were estimated. Models were then built hierarchically whilst increasing in complexity and explanatory potential as more predictors were added in the third, fourth and fifth stage. Random intercept models using the first order Marginal Quasi-likelihood (MQL); second order Predictive or Prenalized Quasi-Likelihood (PQL); and Markov Chain Monte Carlo (MCMC) estimation methods in the third, fourth and fifth stage respectively were built (Note 10). As it was for the indirect measure, separate estimations for the key independent variables were essential to avoid multi-collinearity.

Table 4 presents the results on RE and MRY. The null model depicts a relatively high variance of 0.34 that necessitates multilevel modeling. The coefficient of RE is positively related to the dependent variable, significant at 10 percent level in model 2-4. Taking estimates from the superior estimation (MCMC), the ordered logit of having re-elected MPs in an improved category is 0.2 higher. Tables 5 and 6 present EC and PF results respectively but are not significant.

Similarity in significance and sign in Tables 4-6 supports collective presentation of other control variables. The RNH shows negative associations with efficiency. However, this negative association is the highest in *community* access. A negative association is also witnessed for the DNT. Among the district covariates, only SM was found significant at 1 percent level, depicting a negative relationship. Some categories *of* MM are significant, but this is not uniform across Tables. For instance, category 2 (*more moved out*) shows a negative relationship and significant at the l and 5 percent level only in Table 4 and 5 respectively. Category 4 (*Neither arrivals nor departures*) is negative and significant at 10 percent level in all Tables. Note that significant categories of massive migration are reflected in the

MCMC estimation. Tables 4 to 6 depict an increase in the variance between districts as the models become more complex.

Table 4. Results of the Direct Measure with Re-Election

	Null random intercept model		**MQL**		**PQL**		**MCMC**	
	beta	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**
Intercept of MYR (ref=Worsened)								
Improved	-0.56(0.36)	0.06	0.97(0.73)	0.42	1.05(0.74)	0.44	1.42(0.81)	0.33
Same	1.40(0.80)	0.06	3.09(0.96)	0.42	3.35(0.97)	0.44	3.70(0.98)	0.33
RNY (ref=Paved road)								
Trunk			-0.20^{+}	0.14	-0.21^{+}	0.14	-0.24^{+}	0.14
Feeder			-0.62***	0.12	-0.67***	0.13	-0.69***	0.12
Community			-1.61***	0.12	-1.73***	0.12	-1.75***	0.12
ANR (ref=Other)			-0.09	0.21	-0.08	0.21	-0.16	0.17
DNT			-0.13***	0.03	-0.14***	0.03	-0.13***	0.03
ENT (ref=no)			-0.05	0.06	-0.07	0.06	-0.07	0.06
District level variables								
Re-election (ref=Not re-elected)			0.23^{+}	0.14	0.23^{+}	0.15	0.22^{+}	0.16
DM (ref=No)			0.00	0.14	0.00	0.15	0.03	0.16
SM (ref=No)			-0.41***	0.14	-0.45***	0.15	-0.51***	0.15
PDP (ref=No)			0.17	0.15	0.18	0.16	0.16	0.17
TD(ref=No)			0.01	0.20	0.04	0.22	0.02	0.22
PR (ref=No)			0.02	0.17	0.01	0.18	-0.04	0.19
MM (ref= More moved in)								
More moved out			-0.30	0.30	-0.37	0.32	-0.60***	0.21
About the same of both			0.06	0.31	0.04	0.32	-0.18	0.20
Neither arrivals nor departures			-0.11	0.31	-0.14	0.33	-0.37^{+}	0.19

Between district variance (intercept)	0.34	0.06	0.35	0.06	0.40	0.06	0.44	0.07
Districts	106		106		106		106	
Households	8369		8369		8369		8369	
Deviance (MCMC)							15969.88	

Note. Z-scores (beta/std err) 1.28-1.96 (+), 1.96-2.32 (*), 2.33-2.5 (**), 2.5> (***).

Table 5. Results of the Direct Measure with New Constituency

	MQL		**PQL**		**MCMC**	
	beta	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**
Intercept of MYR (ref=Worsened)						
Improved	1.02(0.73)	0.43	1.10(0.75)	0.45	1.65(0.84)	0.56
Same	3.14(0.96)	0.43	3.40(0.97)	0.45	3.94(0.98)	0.56
RNH (ref=Paved road)						
Trunk	-0.20^{+}	0.14	-0.21^{+}	0.14	-0.22^{+}	0.14
Feeder	-0.62***	0.12	-0.67***	0.13	-0.67	0.12***
Community	-1.60***	0.12	-1.73***	0.12	-1.73	0.11***
ANR (ref=Other)	-0.09	0.21	-0.08	0.21	-0.21	0.17
DNT	-0.13***	0.03	-0.37***	0.03	-0.14	0.03***
ENT (ref=no)	-0.05	0.06	-0.07	0.06	-0.07	0.62
District level variables						
EC (ref=yes)	-0.15	0.14	-0.16	0.14	-0.18	0.16
DM (ref=No)	0.01	0.15	0.01	0.16	-0.03	0.20
SM (ref=No)	-0.40***	0.15	-0.45**	0.15	-0.39***	0.19
PDP (ref=No)	0.15	0.15	0.17	0.16	0.12	0.02
TD (ref=No)	0.05	0.20	0.08	0.21	-0.03	0.27
PR (ref=No)	-0.01	0.17	-0.01	0.18	-0.01	0.18
MM (ref=More moved in)						
More moved out	-0.25	0.30	-0.32	0.32	-0.61*	0.30
About the same of both	0.09	0.31	0.08	0.32	-0.28	0.36
Neither arrivals nor departures	-0.05	0.31	-0.08	0.33	-0.40	0.33
Between district variance (intercept)	0.35	0.06	0.40	0.06	0.46	0.08
Districts	106		106		106	

Households	8369	8369	8369
Deviance (MCMC)			15969.55

Note. Z-scores (beta/std err) 1.28-1.96 (+), 1.96-2.32 (*), 2.33-2.5 (**), 2.5> (***).

Table 6. Results of the Direct Measure with Party Fragmentation

	MQL		**PQL**		**MCMC**	
	beta	**Std.Err**	**beta**	**Std.Err**	**beta**	**Std.Err**
Intercept of MYR (ref=Worsened)						
Improved	0.91(0.71)	0.43	0.99(0.73)	0.45	0.71(0.67)	0.27
Same	3.02(0.95)	0.43	3.29(0.96)	0.45	2.99(0.95)	0.27
RNH (ref=Paved road)						
Trunk	-0.20+	0.14	-0.21+	0.14	-0.23+	0.15
Feeder	-0.61***	0.12	-0.67***	0.13	-0.69***	0.14
Community	-1.60***	0.12	-1.73***	0.12	-1.75***	0.14
ANR (ref=Other)	-0.08	0.21	-0.08	0.21	0.02	0.23
DNT	-0.13***	0.03	-0.14***	0.03	-0.13***	0.03
ENT (ref=no)	-0.05	0.06	-0.02	0.06	-0.07	0.06
District level variables						
Re-election (ref=Not re-elected)						
EC (ref= yes)						
PF (ref=Mixed)	0.03	0.13	0.03	0.14	0.01	0.11
DM (ref=No)	-0.02	0.15	-0.02	0.16	-0.01	0.17
SM (ref=No)	-0.41***	0.15	-0.46***	0.16	-0.47***	0.18
PDP (ref=No)	0.15	0.15	0.16	0.16	0.17	0.14
TD (ref=No)	0.06	0.20	0.09	0.22	0.07	0.24
PR (ref=No)	0.02	0.17	0.02	0.18	0.02	0.15
MM (ref= More moved in)						
More moved out	-0.21	0.30	-0.28	0.32	-0.05	0.23
About the same of both	0.12	0.31	0.10	0.33	0.35+	0.25
Neither arrivals nor departures	-0.04	0.31	-0.06	0.33	0.17	0.26
Between district variance (intercept)	0.36	0.06	0.41	3064.00	0.46	0.08
Districts	106		106		106	
Households	8369		8369		8369	
Deviance (MCMC)					15970.22	

Note. Z-scores (beta/std err) 1.28-1.96 (+), 1.96-2.32 (*), 2.33-2.5 (**), 2.5> (***).

5.3 Are Re-election, Party Fragmentation and New Electoral Constituency related to the Routine Manual Maintenance and the Expenditure of Road Maintenance?

As an ultimate robustness check, we obtained information on the number of kilometers that underwent routine manual maintenance (*RMMkm*) and actual road maintenance expenditures in Ugandan shillings (*Expenditure*) for 2016 per district from the 2016/17 road fund report (Note 11). RMMkm and Expenditure were transformed to square root and logs respectively to meet the normality test. We use these two variables as our dependent variables in separate estimations to test the relationship they have on our main explanatory variables. We apply a mixed random regression estimation, with the region as our random variable using STATA version 15. The results in Table 7 show that districts with re-elected leaders are likely to have less RMMkm in column one. This means that districts that have more re-elected leaders are less likely to report better road service. RE is insignificant in column six. That is to add, RE is not related to spending. The EC and PF coefficients are significant and negative in columns 4 and 5. The more divided the government system, the lower the expenditure on road servicing. The younger the electoral districts, the lower the budget needed for road maintenance. Cost savings could imply faster service delivery. There is a caveat on these results due to differences in periods between the dependent variable (captured in 2016) and the explanatory variables (captured in 2001-2011). This means that the association between the RMMkm and expenditures is an ex-ante relationship.

Table 7. Correlation between Number of Road Kilometers That Underwent Rmmkm and Road Maintenance Expenditure in 2016 and Re-Election, New Constituency and Party Fragmentation

	1	2	3	4	5	6
Re-election	-3.35**					0.10
	(1.39)					(0.12)
EC (ref = no)		2.34		-0.50***		
		(1.53)		(0.10)		
PF (ref = mixed)			0.37		-0.38***	
			(1.94)		(0.13)	
PDP (ref = no)	2.72*	2.46*	2.50*	0.19	0.18	0.19
	(1.41)	(1.50)	(1.50)	(0.12)	(0.12)	(0.15)
PR (ref = no)	-1.27	-1.56	-0.97	-0.01	-0.20	-0.13
	(1.52)	(1.44)	(1.50)	(0.18)	(0.15)	(0.17)
More moved out	-3.70	-4.21	-4.76*	0.35	0.43	0.44
	(2.32)	(2.75)	(2.68)	(0.25)	(0.37)	(0.34)
About the same of	-5.71***	-6.06***	-6.42***	0.12	0.13	0.14
both	(1.69)	(1.61)	(1.77)	(0.23)	(0.34)	(0.30)

Neither arrivals nor	-7.54***	-8.23***	-8.36***	0.22	0.24	0.22
departures	(1.88)	(1.78)	(1.88)	(0.24)	(0.35)	(0.31)
DM	-1.05	-1.19	-0.63	-0.03	-0.16*	-0.11
	(1.73)	(1.79)	(1.70)	(0.10)	(0.09)	(0.10)
Constant	14.62**	14.35**	13.52**	12.18***	12.68***	12.23***
	(6.13)	(5.72)	(6.06)	(0.40)	(0.41)	(0.37)
N	107	107	106	105	104	105

Notes. Standard errors in parentheses; *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

Models 1-3 use actual number of kilometers that were routine manually maintained. Models 4-6 use the expenditure on road maintenance in Uganda shillings. All models use a random mixed level regression using STATA version 15 and are robust to account for heterogeneity biases. 1. *More moved out*; 2. *About the same of both* and 3. *Neither arrivals nor departure*s correspond to categories of massive migration with *more moving in* taken as the reference.

5.4 Accounting for Potential Endogeneity

We account for potential endogeneity from the perspective of reelection because it is our dominant outcome. To this end, our instrument is an indicator variable from the 2016/17 UNHS household module that asks about the length of stay. This question is asked as "Since 2012, has [NAME] lived in another place, such as another village, another town, or country, for 6 or more months at one time?" We collapse this variable to the district level and create two variables by counting households that answered yes and those that answered no. Our choice of this variable stems from Anderson, McGregor, and Pruysers' (2020) expectations that voters who have lived in the city for a longer period are more likely to correctly identify first- and second-place candidates than voters who have lived in the city for less time. In essence, voters who have lived in a city longer are likely to re-elect leaders. We believe that the voters' length of stay does not lead to better road maintenance but affects reelection.

Therefore, to resolve the endogeneity with the indirect measure (DHQ) and reelection, we ran a two-stage least squares regression. First, we estimated a probit model with RE as the dependent variable and our yes and no dummies as covariates. We obtain the predicted values of RE. We use the yes and no dummies and the predicted values of RE as instrumental variables interchangeably between models to avoid the *forbidden regression* (see Wooldridge, 2010, p. 235). The results in Table 8 show insignificant results even when we cluster at the district level and the sign of the coefficient is negative, which is consistent with our proposed hypothesis but contrary to the result of the baseline regression. Note that the instrumental variables are quite strong, especially the predicted values. In Table 9a and 9b, we perform two-stage estimation to resolve a reserve causality bias in our direct measure (we used *ivprobit* command in Stata). Using instruments similar to those used in Table 8, interchanged between the different models, we obtain insignificant results. This means that our results in Tables 8 and 9a, b show that the relationship between RE and RME is endogenous.

Table 8. Relationship between Reelection on Distance to Headquarters (Kms): Instrumental Variable Approach

	1	2	3	4
Reelection	-0.16	-0.20	-0.13	-0.19
	(0.18)	(0.18)	(0.17)	(0.17)
ENT (ref = no)	0.23**	0.24**	0.22**	0.23**
	(0.10)	(0.10)	(0.10)	(0.10)
ANR (ref=Other)	-0.23	-0.24	-0.22	-0.23
	(0.32)	(0.32)	(0.31)	(0.31)
DNT	0.39***	0.40***	0.39***	0.40***
	(0.05)	(0.05)	(0.05)	(0.05)
PDP (ref=no)	0.23	0.23	0.23	0.23
	(0.19)	(0.19)	(0.19)	(0.20)
PR (ref=no)	-0.61***	-0.60***	-0.64***	-0.62***
	(0.19)	(0.19)	(0.19)	(0.19)
Trunk	0.70***	0.70***	0.71***	0.71***
	(0.27)	(0.27)	(0.26)	(0.27)
Feeder	0.54***	0.54***	0.54***	0.54***
	(0.19)	(0.19)	(0.19)	(0.19)
Community	0.68***	0.68***	0.67***	0.68***
	(0.18)	(0.18)	(0.18)	(0.18)
DM (ref=no)	-0.15	-0.13	-0.16	-0.14
	(0.18)	(0.18)	(0.18)	(0.18)
SM (ref=no)	-0.33*	-0.32*	-0.35*	-0.35*
	(0.19)	(0.19)	(0.19)	(0.19)
MM	0.06	0.06		
	(0.10)	(0.11)		
More moved out			0.36**	0.36**
			(0.17)	(0.16)
About the same of both			0.48**	0.48***
			(0.19)	(0.19)
Neither arrivals nor departures			0.39	0.41*
			(0.25)	(0.25)
Constant	4.36***	4.32***	4.23***	4.20***
	(0.53)	(0.52)	(0.55)	(0.54)
Test for weak instrument				

Effective F-statistic	19.94	66.58	38.25	23.03
Largest critical value (5%)	23.97	37.42	28.55	24.22
N	8369	8369	8369	8369
R^2	0.07	0.07	0.07	0.07

Notes. Standard errors in parentheses; *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

Table 9a. Effects of Reelection in Last Two Years: Instrumental Variable Approach

	1	2	3	4
Second Stage				
Reelection	0.04	0.04	0.04	0.04
	(0.10)	(0.11)	(0.09)	(0.04)
DM (ref=no)	-0.03	-0.03	-0.03	-0.03
	(0.11)	(0.12)	(0.11)	(0.04)
SM (ref=no)	-0.31***	-0.31***	-0.31***	-0.31***
	(0.10)	(0.10)	(0.10)	(0.04)
More moved out	-0.29**	-0.29**	-0.29**	-0.29***
	(0.15)	(0.15)	(0.15)	(0.09)
About the same of both	0.04	0.04	0.04	0.04
	(0.14)	(0.14)	(0.14)	(0.09)
Neither arrivals nor departures	-0.10	-0.10	-0.10	-0.10
	(0.15)	(0.16)	(0.15)	(0.09)
ENT (ref=no)	0.07	0.07	0.07	0.07
	(0.07)	(0.07)	(0.07)	(0.04)
ANR (ref=other)	-0.30	-0.30	-0.30	-0.30*
	(0.20)	(0.20)	(0.20)	(0.18)
DNT	-0.11***	-0.11***	-0.11***	-0.11***
	(0.03)	(0.03)	(0.03)	(0.02)
PDP (ref=no)	-0.12	-0.12	-0.12	-0.12***
	(0.12)	(0.12)	(0.12)	(0.04)
PR (ref=no)	-0.01	-0.01	-0.01	-0.01
	(0.12)	(0.12)	(0.12)	(0.05)
Trunk	-0.13	-0.13	-0.13	-0.13
	(0.17)	(0.17)	(0.17)	(0.12)
Feeder	-0.27*	-0.27*	-0.27*	-0.27**
	(0.15)	(0.15)	(0.15)	(0.11)
Community	-0.67***	-0.67***	-0.67***	-0.67***

	(0.15)	(0.15)	(0.15)	(0.10)
Constant	2.49***	2.49***	2.49***	2.49***
	(0.38)	(0.38)	(0.38)	(0.26)

Table 9b. Effects of Reelection in Last Two Years: Instrumental Variable Approach

First stage				
DM (ref=no)	0.22	0.32*	0.23	0.22***
	(0.19)	(0.19)	(0.19)	(0.02)
SM (ref=no)	0.08	-0.05	0.06	0.08***
	(0.18)	(0.18)	(0.18)	(0.02)
More moved out	0.29	0.01	0.26	0.29***
	(0.46)	(0.46)	(0.45)	(0.05)
About the same of both	0.41	0.14	0.39	0.41***
	(0.46)	(0.47)	(0.45)	(0.05)
Neither arrivals nor departures	0.48	0.21	0.45	0.48***
	(0.47)	(0.47)	(0.46)	(0.05)
ENT (ref=no)	0.06	0.15**	0.07	0.06***
	(0.05)	(0.07)	(0.06)	(0.02)
ANR (ref=other)	0.07	-0.07	0.05	0.07
	(0.14)	(0.14)	(0.14)	(0.07)
DNT	-0.01	0.03	-0.00	-0.01
	(0.03)	(0.04)	(0.03)	(0.01)
PDP (ref=no)	-0.02	-0.06	-0.02	-0.02
	(0.17)	(0.17)	(0.17)	(0.02)
PR (ref=no)	0.30*	0.33*	0.30*	0.30***
	(0.17)	(0.18)	(0.17)	(0.02)
Trunk	-0.05	0.01	-0.04	-0.05
	(0.11)	(0.11)	(0.11)	(0.05)
Feeder	-0.02	0.02	-0.01	-0.02
	(0.08)	(0.09)	(0.08)	(0.04)
Community	0.04	0.10	0.05	0.04
	(0.08)	(0.08)	(0.08)	(0.04)
Duration of stay-Yes	0.00	-0.00***		0.00***
	(0.00)	(0.00)		(0.00)
Duration of stay-NO	-0.00***		-0.00***	-0.00***
	(0.00)		(0.00)	(0.00)

Constant	0.10	-0.11	0.10	0.10
	(0.66)	(0.67)	(0.66)	(0.11)
athrho2_1				
_cons	-0.04	-0.04	-0.04	-0.04
	(0.08)	(0.08)	(0.07)	(0.03)
lnsigma2				
_cons	-0.38***	-0.32***	-0.38***	-0.38***
	(0.05)	(0.05)	(0.05)	(0.01)
N	8369	8369	8369	8369

Notes. Standard errors in parentheses; *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

6. Discussion

The re-election coefficient is not the same for both measures. The association between DHQ as a measure of efficiency meets our hypothesis that re-elected leaders are likely to lower the road service efficiency. Our robustness check in Table 7 confirms that the result in Table 2 is certain. Our results in the indirect measure and the robustness check confirm prior work. For instance, Dumpos and Cohen (2014) who measured re-election exactly as we do in this paper and found a negative result, significant at 10 percent. Second the negative association can be linked to literature that argues that a ed administration may be less inclined to ensure quality of a service especially if that was the last chance for them at office (Doumpos & Cohen, 2014; Hlepas, 2010). Although the result at the direct measure is contrary to the proposed hypothesis, it collaborates with prior studies that find a positive effect between administrations at the second mandate and efficiency (D'Inverno et al., 2018). Therefore, the association of re-election in this paper is a mixed one and depends on the measurement of the dependent variable.

The EC coefficient was found to lead to improved efficiency in the indirect measure. In line with our proposed hypothesis, this result was confirmed robust in Table 7. To the best of our knowledge there is no prior study that has assessed new ECs as an explanatory variable for PSE and therefore our result cannot be compared to other literature. Therefore, we contribute to this strand of literature from this standpoint. The result is attributed to more funds allocated to such areas. The proper use of these funds may lead to higher RME. This, however, does not mean the advocacy of the creation of districts. While this result fits our hypothesis, we do not provide any policy implications but rather point to further investigations of the role of creating numerous electoral constituencies in service efficiency.

The result that says districts with incumbent dominance are associated with better reported efficiency in the indirect measure is confirmed robust, contrary to our hypothesis. Other studies had referred to incumbency dominance as strong political strength because there are fewer political parties. For instance, Doumpos and Cohen (2014) argue that minimal political opposition could signal fewer resources in negotiation. As argued in the measurement section, incumbent affiliation is associated with

better capacity at handling fewer resources. This capacity is what Doumpos and Cohen refers to as fewer resources in negotiation. Higher service efficiency associations to lower political opposition have also been found in many prior studies (Borge et al., 2008; Da Cruz & Marques, 2014; Geys et al., 2010; Helland & Sørensen, 2015; Kalb, 2014; Revelli & Tovmo, 2007).

7. Conclusions

We examine in this paper whether Re-Election (RE), presence of a new Electoral Constituency (EC), and Political Fragmentation (PF) of local government parliamentary representatives significantly affect Road Maintenance Efficiency (RME). We measure RME indirectly (distance to district HQ) and directly (road maintenance in the last two years).

The results revealed both indirect and direct effects of political factors on RME. An indirect effect is reflected in all the three key independent variables and confirmed robust in alternative measures of the number of kilometers that underwent routine manual maintenance (Re-election) and expenditure for road maintenance (EC and PF). The relationship is positive in re-election and negative in EC and PF. A direct effect was shown to be positive in re-election and insignificant in EC and PF. While two of our main explanatory variables (RE and EC) met our expected hypothesis, they cannot be used for any policy implications in the current dispensation of low budgets.

Since re-election is our dominant result, we suggest two possible implications. First, is a reconstruction of electoral gap years, and second is a reduction of term limits for local government echelons of leadership. These implications mean that more years allocated between electoral years could discourage the incidence of re-election that arises from the need to recoup from the investment without compromising on service efficiency. Furthermore, leaders have a chance of longer staying in power and learn from past mistakes.

Reflectively, our results also point to further investigations using better data. The limitation of the study is the use of various data sources, which may have corrupted the expected policy result. For instance, our vital explanatory variables are created from electoral data, while other control variables hail from the UNHS. While the data year may somewhat collude, different data sources are likely to distort the implication of the obtained results. Retroactively, future studies could ensure the use of a single database.

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Notes

Note 1. Political capital refers to the chances that politicians get party majority or get reelected to office in a district.

Note 2. Note that district is used interchangeably with local government.

Note 3. Grossman and Lewis (2014) highlight that only 13% of district chairman incumbents made it back to power in the 2011 elections.

Note 4. Local government political leaders include MPs and district women MP and district local chairpersons- up to sub county level. District administrative officers include the resident district commissioner, and the chief executive officer.

Note 5. As a pilot study, key informant interviews with district and municipal engineers; SCCs; headmen were conducted. Districts visited were Soroti, Kisoro, Mbarara, Kotido, Moroto districts. Also interviewed was Uganda National Road Authority- Head of Maintenance and the program officer for national roads and Kampala City Council Authority at the Road Fund. Interviews were held between the 10th July and the 20th August 2019.

Note 6. This measure arises from the discovery that some constituencies were new while forming the re-election measure. It is therefore possible that the omission of new constituencies in the formation of the re-election measure would be erroneous. Hence the need to investigate the role they play in public service efficiency.

Note 7. Note that although 122 districts are captured in the NSDS, the capital-Kampala, and Uganda Bureau of Statistics (UBOS) unclassified districts were left out; hence 111 districts.

Note 8. Some districts had a mix of NRM and other parties but because NRM is the dominant; two categories were formed. The first with NRM only and the second with mixed party affiliation. The mixed category has the following parties; Forum for Democratic Change (FDC), Uganda People's Congress (UPC), Democratic Party (DP) and non-affiliates known as Independent MPs.

Note 9. Moreover results from the MCMC were not significant but available on request.

Note 10. The default estimation procedure is MQL using the iterative Generalized Least Squares (IGSL) estimation control. The PQL using the IGSL estimation control is a preferred method as it estimates it approximately linearly. The MCMC offers stable and agreeable standard errors. Unlike the default first order MQL that underestimates standard errors or downplays the estimates especially when the response proportion is extreme, the PQL using second order terms improves the estimates. However, the second order PQL is less stable and may encounter convergence problems. However, the MCMC requires base line estimates (Rasbash et al., 2000) and hence we first estimate the first order MQL and then the second order PQL.

Note 11. RMMkm refers to road maintenance activities denotes daily, weekly or monthly maintenance such as slashing of shoulders, desilting drainages, and other manual work done by road gangs who are on an annual contract and are paid a monthly wage. We also assessed the association of our main explanatory variables on the number of road kilometers that under routine mechanized and periodic maintenance, the result was insignificant.