Working paper

Political favoritism and the targeting of power outages

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Political Favoritism and the Targeting of Power Outages

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Abstract

Research in distributive politics has largely overlooked how the quality of service provision affects the expectations of voters and their receptivity to new government goods and services. Most empirical studies focus only on whom and where governments target their distributional strategies, without accounting for variations in the quality of services in these areas. I argue that the expected electoral payoff of service provision depends crucially on the pre-existing level of quality of services. Using new data spanning the escalation and resolution of a major power crisis in Ghana, I show that the government was much more likely to target electricity supply to areas that had both experienced the worst disruptions in service quality *and* were electorally crucial. The results suggest that ignoring service quality is likely to be an important source of omitted variable bias in empirical research on public service provision.

The key question of distributive politics is how political leaders decide to allocate public services and goods to their constituents. The question is especially crucial in the developing world where, for many citizens, access to basic services depends wholly on the choices of the government and its agents. The most important models predict that distributional strategies depend on electoral considerations, and a vigorous debate asks whether swing or core supporters are more likely to be targeted (Dixit and Londregan 1996, Cox and McCubbins 1986). Yet empirical findings have become increasingly fragmented, with inconsistent conclusions and contradictory results that have yielded few generalizable insight beyond the fact that politics seem to matter, in some nebulous sense. An important analysis by Kramon and Posner (2013) shows that even within the same country, patterns of favoritism may differ entirely depending on which public service is being studied.

I argue that these inconsistent results may arise because many studies fail to account for the quality of public service provision in their auditing of where and whom governments target with goods and services. Especially in the developing world, the quality of service provision is often more politically salient than either access to services or spending on services. After all, water pumps are useless if wells are dry or the water is contaminated. Light bulbs provide no value when the power is not working. Roads become obstacles when they are damaged or are washed away. And expenditures are irrelevant if they do not actually improve the flow of services to constituents. The quality of service provision is analytically distinct from access to or spending on services, which are more typically the object of study.

Drawing upon new data on the quality of electricity service provision in Ghana, I demonstrate that strategies of targeting of electricity depends crucially on the quality of electricity supply already flowing to a constituency.

This paper adds to the literature on sources of variation in government distributional strategies, including those that emphasize how legislator-specific factors shape the level of effort to distribute benefits (Keefer and Khemani 2005, Holland 2015), or lead to different policy priorities (Chattopadhyay and Duflo 2004, Golden and Picci 2008, Clots-Figueras 2011, Baskaran, Bhalotra, Min, and Uppal 2018); and constituency-specific factors like how the ethnic composition of areas shape the allocation decisions of legislators (Ichino and Nathan 2013, Nathan 2016, Harris and Posner 2018). The paper builds on a small but growing literature on service provision failures, including work by Post, Kumar, Otsuka, and Pardo-Bosch (2018) on disruptions to water supply in Bangalore.

1 Quality of Service

Much of the distributive politics literature assumes that distributional strategies are crucially shaped by electoral considerations (Golden and Min 2013). The most widely used models predict targeting of core or marginal voters in order to maintain or win future support (Dixit and Londregan 1996, Cox and McCubbins 1986). In the landmark models, core targeting should be the preferred strategy in some contexts, with swing voter targeting in other contexts. These strategies may differ depending on whether the objective is to influence vote preferences or to optimize voter turnout (Nichter 2008, Stokes, Dunning, Nazareno, and Brusco 2013). Further refinements have emphasized how a portfolio allocation model may be optimal, targeting a mix of goods across both swing and core groups (Diaz-Cayeros, Estévez, and Magaloni 2016).

Yet despite the influence of these theoretical models, the empirical literature is filled with contradictory results, and many studies find only weak evidence in support of political targeting.[2] The fragility of these results is both surprising and troublesome, given the widespread belief on the ground, in newspapers, and among scholars that political factors have paramount importance in shaping distributional strategies.

I argue that the *quality* of public service delivery represents a crucial omitted variable in many studies of distributive politics. The political impacts of new distributional efforts depend crucially on both the pre-existing level of access to a service as well as the quality of those services. Yet while it is standard to control for pre-existing levels of access, many studies do not account for variation in the quality of services.

The quality of services is crucial to any account of public service delivery for three interrelated reasons. First, voters care as much, if not more, about the quality of services as they do about access to services. Gaining new access to a public service, like piped water

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[2]See reviews in Golden and Min (2013) and Kramon and Posner (2013)

or electricity, is a one-time transformational change to a household. But without continued investments into maintenance, reliability, and service delivery, the benefits from any public service are likely to be short-lived.

Second, the quality of service flows determines the expectations of voters about the future. Patterns in the flow of services over time create expectations about what the quality of a service will be in the future. For residents accustomed to reliable and consistent power supply, a one-day power cut is enormously disruptive. But for residents living in areas with chronic power supply problems, the same power cut would appear routine. The weight of these differing expectations create powerful opportunities for politicians to strategically target their efforts at change.

Third, the quality of pre-existing services determines the marginal utility of future service provision efforts. Because of diminishing returns, investments to improve quality will have a larger marginal effect when the quality level is low than in settings that already enjoy moderate or high quality services. This implies that efforts to improve service quality will have different yields on welfare outcomes, and that the expected yield for political leaders who deliver services will be conditional on the pre-existing quality of services.

These factors suggest that a strategic politician seeking to maximize political and welfare gains, would need to account for underlying variations in the quality of pre-existing services before deciding where to allocate their future efforts.

Ignoring service quality is an important source of omitted variable bias in empirical research on public service provision. An ideal study testing whether new water well placement is influenced by electoral considerations would need to take into account both the location of existing water wells and the quality of existing wells. Knowing where wells already exist is necessary to identify pockets of unmet demand. But because groundwater wells can deteriorate, dry up, or become contaminated, it is crucial to also know which wells are usable and which are not. According to one report, up to 50,000 water supply

points across Africa are unusable due to lack of maintenance, and 58% of wells in northern Ghana are in disrepair.[3]

Yet because data on quality of service is usually difficult to obtain or missing entirely, the typical study does not account for this crucial dimension. A study might then misinterpret the digging of new water wells as evidence of political favoritism, when it could have been driven by efforts to respond to the poor quality of existing wells.

2 Dumsor and the Political Economy of Power Cuts in Ghana

In August 2012, the West African Gas Pipeline (WAGP) was damaged by the anchor of a ship that was trying to avoid a pirate attack. The incident caused a complete shutdown of the pipeline and the delivery of natural gas to Ghana and its neighbors.[4] The disruption caused shockwaves across the country's fragile power sector, already in a precarious state due to historically low water volumes at Lake Volta, which supports the massive 1 gigawatt Akosombo hydroelectric dam. While power cuts were not new in Ghana, the number and length of outages increased dramatically. Ghanaians began referring to the power cuts as *dumsor* — alluding to the on again, off again nature of electricity throughout the country. By 2015, the power crisis had reached unprecedented levels. By one account, there were 159 days of blackouts that year, though the true number of outages and their impact is hard to know.[5] Dumsor would emerge as one of the most politicized issues heading into the 2016 presidential election.[6]

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[3]International Institute for Environment and Development. 2009. "Where every drop counts: tackling rural Africa's water crisis"

[4]AllAfrica, August 29, 2012. "West African Gas Pipeline Company Shuts Down Operation." `https://allafrica.com/stories/201208290468.html`

[5]Dumsor may have resulted in $US 3 billion in losses according to one estimate. `https://www.pulse.com.gh/news/power-crisis-dumsor-cost-us-3billion-nana-addo-id7146430.html`

[6]Kwaku Osei, *New York Times*, 26 December 2016. "The End for Ghana's 'Power-Cut' President."

President John Mahama of the National Democratic Congress (NDC), who had been elected only a few months before the WAGP pipeline disruption, argued that the power crisis was due to external factors beyond the government's control. But for many Ghanaians, the most irksome part of dumsor was knowing that the government and its state utility were making all the decisions about where and when power cuts were imposed.

Many were convinced that power cuts were worse in their neighborhoods than in others. Newspaper accounts frequently called out power cuts to some areas, while rarely mentioning other areas. In a popular crowd-sourced campaign to report outages via text message, dumsor rates were found to vary widely across Accra's neighborhoods. While the Chorkor neighborhood had power during only 31% of the 336 surveyed hours in 2015, electricity flowed 98% of the time to Ridge, only 5 miles to the east.[7] The incidence of dumsor was also found to fall disproportionately upon Accra's poorest neighborhoods (Aidoo and Briggs 2018).

Power cuts provide a unique window into the political priorities of the state and its leaders. During periods of excess demand, power must be shut off to portions of the grid. Priorities shape the way these decisions are made. As one ECG official explains, "We have specialised or sensitive customers among the customer list," including hospitals, water plants, police stations, and leading universities. "[After] you give to all these areas or sectors you have none left."[8] Since government leaders can apply significant pressure on public utilities regarding how, when, and where power is provided, many observers speculate that power cuts are targeted for political purposes.

Ghana's load shedding problems were severe but far from unique. Load shedding has increased dramatically around the world due to the rapid increases in electricity access without concomitant investments in new power supply. In Sub-Saharan Africa, the num-

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[7]The Dumsor Report, `https://twitter.com/dumsorreport`. See also Cobbinah and Adams (2018).
[8]Caterina Clerici, Marisa Schwartz Taylor and Kevin Taylor, *Al Jazeera*, 2016. "Dumsor: The electricity outages leaving Ghana in the dark."

ber of people with electricity has more than quintupled from 1990 to 2016 (81 million to 442 million), but total electricity power supply on the continent has only doubled, from 318 TWh to 784 TWh.[9] New rural electrification initiatives are politically popular and deliver profound benefits to the rural poor (Dinkelman 2011, Min 2015), but they add large numbers of mostly unprofitable consumers to the rolls of stressed utilities. Meanwhile, the fiscal impacts of these efforts are aggravated by subsidy regimes which both become increasingly costly to the state and become too politically costly to eliminate (Bril-Mascarenhas and Post 2015, Kale 2014, Lal 2006). Stretched thin by more customers and less money, many utilities have been unable to invest in new power supply, keep up with required maintenance, and satisfy the growing demand for electricity within their countries (Eberhard 2011).

During the run-up to the December 2016 presidential elections, both presidential candidates jockeyed for advantage over the dumsor issue. President Mahama pursued desperate efforts to improve the power situation, including signing a costly and controversial agreement to add 450 megawatts of power from an offshore barge, a technology typically used to provide short-term power in temporary situations.[10] Meanwhile, Nana Akufo-Addo of the New Patriotic Party (NPP), blamed Mahama relentlessly for the power crisis and promised to "end dumsor" in his campaign speeches and party manifesto.[11] The election was won by Akufo-Addo in a landslide with a margin of 9.5 points, or a million votes among the 10.4 million votes cast.

By the end of 2017, the frequency and length of power outages had declined substantially by most accounts. Who benefited most from improvements in electricity supply in the pivotal year following the 2016 elections? Standard distributive politics theories would expect that the biggest beneficiaries of an electoral victory should be core and/or swing

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[9]World Bank Data and IEA Energy Statistics.
[10]"Power ship steams into Ghana port to help end blackouts," *Reuters*, 29 November 2015.
[11]New Patriotic Party 2016 Election Manifesto, p. 14.

voters, and thus regions that supported Akufo-Addo and the NPP would most stand to benefit. But this ignores how dramatic variation in the quality of service provision shapes the expectations of voters and their response to new service delivery. To understand what drives patterns of new service provision, it is therefore crucial to take into account the quality of pre-existing services.

3   Empirical Strategy and Data

A major reason that service quality has not been closely studied is the lack of reliable and consistent data. To identify variations in the quality of electrical service provision, I introduce the Power Supply Irregularity (PSI) index, which identifies variations in the consistency of light output and electricity supply across a nightly time series of some two thousand nights at a resolution of approximately 0.5km. The data analyzed here cover the five year period from 2013–2017, spanning the beginning, peak, and decline of the most intense power crisis ever experienced in Ghana. This includes the first year after the 2012 election in which John Mahama from the NDC was elected president and encompasses the peak of the power crisis in 2015. The data coverage ends one year after the 2016 election which elected Nana Akufo-Addo from the NPP as president. Over the course of 2017, the power situation had significantly improved. The crucial question I examine here is to whom and where did electricity service quality improve the most following the turnover of the presidency in the 2016 election.

Most prior work studying nighttime satellite imagery has relied on data from the DMSP-OLS satellite program. While the DMSP-OLS data are unmatched in their historical coverage, weaknesses in the data quality of the raw data stream are well known (Elvidge et al. 1997). For example, the lack of on-board calibration and unrecorded changes in gain settings mean that accurate changes in brightness cannot be readily inferred by com-

paring two images captured at different time points.

This current project leverages new data from the Visible Infrared Imaging Radiometer Suite (VIIRS). Launched aboard the Suomi National Polar-orbiting Partnership (SNPP) satellite in 2011, VIIRS has dramatically increased the precision and accuracy of nighttime light measurement (Elvidge, Baugh, Zhizhin, and Hsu 2013). The VIIRS nighttime sensor (or day-night band) provides vastly improved spatial resolution and is fully calibrated to accurately record luminosity levels. The detection limit of the VIIRS sensor is also much improved, now 2E-11 Watts/cm2/sr as opposed to 5E-10 Watts/cm2/sr for DMSP-OLS. One important feature of the VIIRS sensor is that its overpass time is now after midnight (near 01:30), as compared to several hours earlier for DMSP-OLS. Thus VIIRS has significant technical advantages over DMSP, although the overpass time is perhaps less ideal for detection of electricity use. However, where electricity is available and used in the form of outdoor electrical lighting, it seems plausible that some lighting is left on even after midnight (Elvidge, Baugh, Zhizhin, Hsu, and Ghosh 2017).

Drawing upon a newly collected VIIRS archive, spanning April 2012–December 2017, I extract brightness levels from all daily GeoTIFFs of VIIRS' Day/Night Band (DNB), which measure radiances from the visible/reflective band of wavelengths between .5–.9 μm. The data are recorded on a constant 15-arcsecond grid (approximately 0.5km x 0.5km at the equator). These 15-arcsecond pixels are the underlying structure of the dataset used here.

Radiance levels are recorded on all nights from April 2012 to December 2017. Values are subsequently dropped if they are considered low-quality by NOAA.[12] If more than one high-quality value was observed during a single night due to multiple overpasses, the earliest recorded value in the night is kept.

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[12]Data are dropped for any of the following reasons: a) they are obstructed by clouds; b) they are sunlit, outside the nighttime cutoff zone (i.e., above the solar zenith angle 101°); c) they are moonlit, with lunar illumination above .0005 lux; d) high energy particles were detected; e) they are obstructed by stray light (solar zenith angle at nadir between 90–118.5°); f) surface lightning was detected; or g) gas flares were detected (temperature ¿ 1200 K and frequency ¿ 1%).

Figure 1: 2017 Average Light Output and Settlements in Ghana
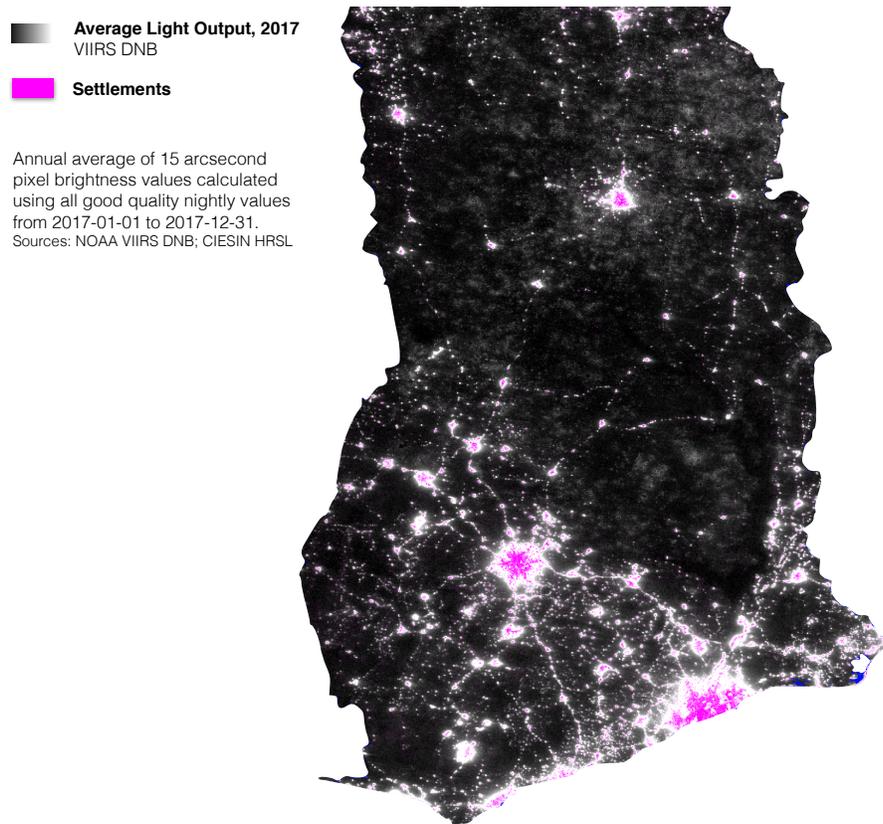
Because the radiance values are heavily right-skewed (i.e., there are some extremely large positive values, relative to the average), and some are slightly negative due to on-board calibration (the technical minimum is -1.5), I follow NOAA and add 2.5 to the remaining values and calculate the natural logarithm of all radiance values. To generate annual estimates, the average of all good quality nightly values for each pixel in each calendar year is calculated.

Since I am interested in the level and variation of anthropogenic sources of lighting, I restrict the data to pixels representing populated areas in Ghana. In order to identify areas with human settlements, I sidestep conventional limitations on the accuracy and reliability of administrative maps by relying instead on new computer-generated data of built-up ar-

eas from the High Resolution Settlements Layer.[13] The data identify all settlements (every building or cluster of buildings) at a 1 arcsecond resolution, using computer vision techniques to detect the outlines of human-built structures from high quality daytime satellite imagery. Figure 1 shows settlements overlaid on top of mean nighttime light output from 2017 VIIRS data.

Merging the settlement layer with the VIIRS lights layer means that each 15-arcsecond pixel comprises up to 225 1-arcsecond settlement pixels. To make the data more manageable and reduce noise from mostly unpopulated pixels, I restrict the sample to 15-arcsecond pixels with at least ten settlements.

In other work, we use a simple classification procedure to determine whether settlements in any 15 arcsecond pixel are electrified or not based upon the level of light output within a calendar year. The procedure can then be used to calculate an electrification rate for any geographic area (Min 2018). We computed satellite-based electrification rates for 2012 and then compared the data against official data from Ghana's 2010 census for all 170 districts. The data are plotted in Figure 2. The correlation of .89 is very high, suggesting that a satellite-based classification method yields estimates of energy access that are very close to those observed by census surveyors.

Having shown that nighttime light output is a reliable indicator of underlying electricity access and use, I now turn to demonstrating how time series data on light output for individual pixels can be used to identify variability in the quality of electricity service provision.

The underlying premise of the Power Supply Irregularity (PSI) index is that a location with stable electricity supply will generate a stable level of light output over time, while a location with unstable electricity supply will exhibit higher variability of light output over that same period. I define PSI as the unexplained variability in light output relative to the

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[13]https://www.ciesin.columbia.edu/data/hrsl/

Figure 2: Comparison of Electrification Rates Inferred From 2012 Satellite Data Against 2010 Census Data
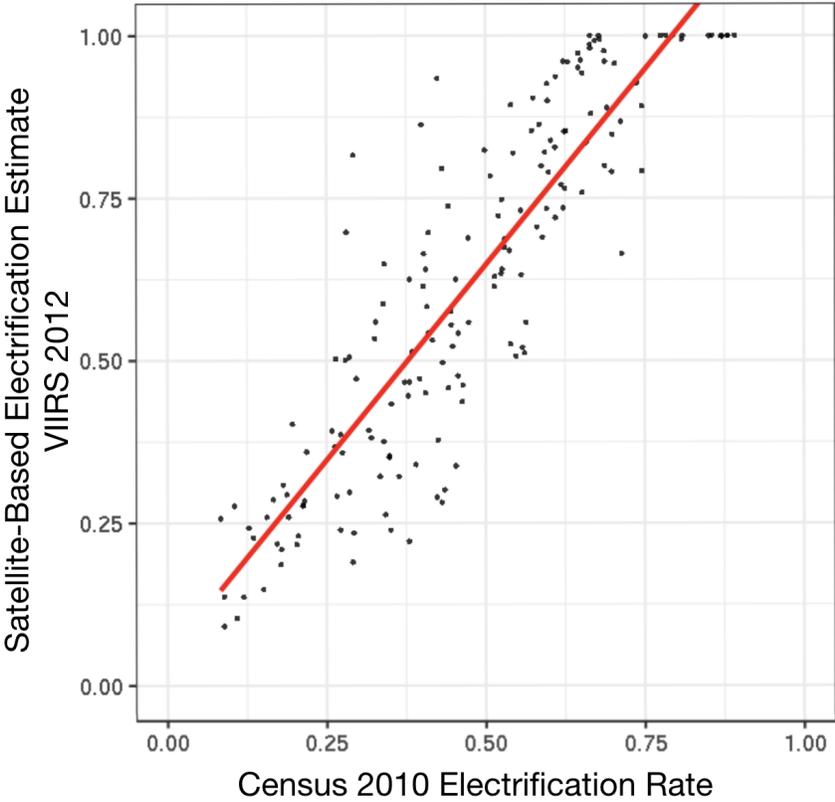
Note: $\rho=.89$. n=170 districts. See Min (2018).

predicted variability of light output for a pixel over the 2012–17 period. This unexplained variability is the residual of a regression using annual data from all relevant settlement pixels. The regression predicts the standard deviation of light output given the brightness of each village, including settlement point fixed effects.

Since calculations of PSI depend on relative comparisons of brightness variability, it is important to include only pixels whose brightness and variability is generated by the same underlying forces.

In Ghana, electricity distribution is managed by two large providers, the Electricity Company of Ghana (ECG) and the Northern Electricity Distribution Company (NEDCo). While NEDCo serves a greater landmass, the majority of Ghana's residents are served by ECG in the more populous southern regions. To reduce the possibility that PSI measurements are affected differentially by these distinct providers, I focus only on ECG-serviced regions in the analysis that follows: Greater Accra, Ashanti, Eastern, Central, Western, and Volta regions. This yields 41,305 populated pixels in the dataset.

Figure 3 illustrates the relationship between mean annual light output and mean annual standard deviation of light output for the relevant populated pixels in ECG-regions in Ghana. PSI for each pixel is the difference between the actual standard deviation and the predicted standard deviation. Pixels with higher standard deviation of light output than the line of best fit are assumed to have experienced greater volatility in power supply during the year. Figure 4 plots spatial variation in PSI scores in three crucial years: 2013, which marks the beginning of the power crisis; the peak of the power crisis in 2015; and 2017 when the power crisis had mostly abated and also marked the first year of rule for President Nana Akufo-Addo and the NPP.

Changes in PSI over time are depicted in Figure 5, which shows the overall change in power supply reliability in 2017 relative to 2013. Figure 6 plots the change in PSI from

Figure 3: Calculating the Power Supply Irregularity Index in Ghana using VIIRS Data
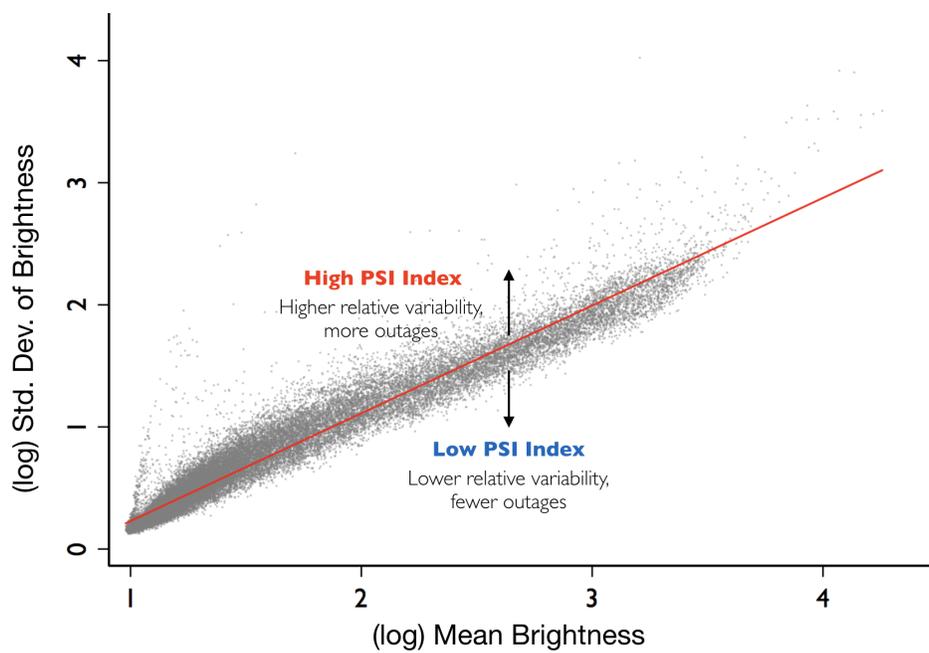
n=41,305. Each point represents a 15 arcsecond (roughly 0.5 km x 0.5 km) pixel with human settlements located in ECG service regions.

Figure 4: Power Supply Irregularity (PSI) Index in Ghana
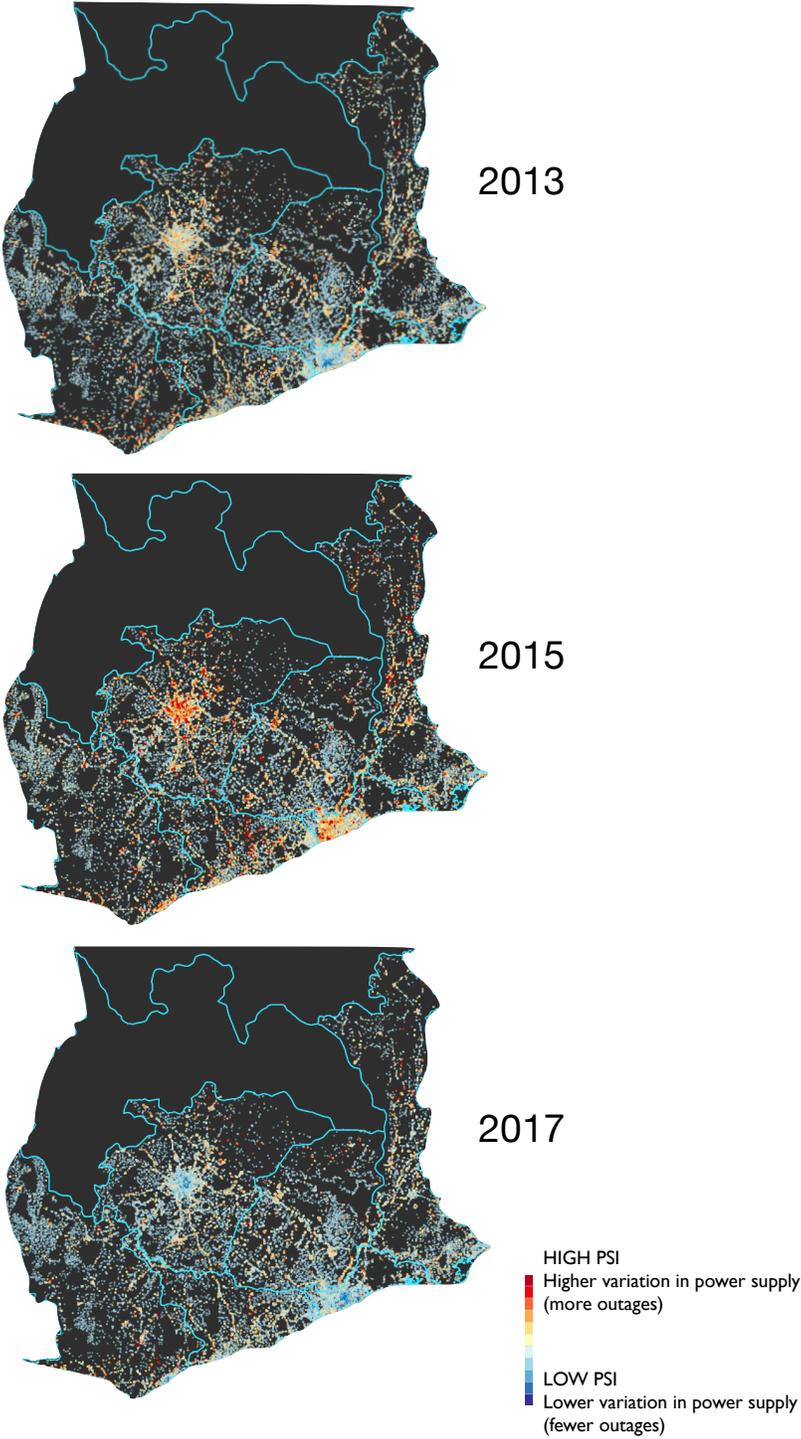
Note: ECG service areas only. Nighttime lights data from VIIRS DNB.

Figure 5: Change in PSI (Power Supply Irregularity) Index in Ghana, 2013–17
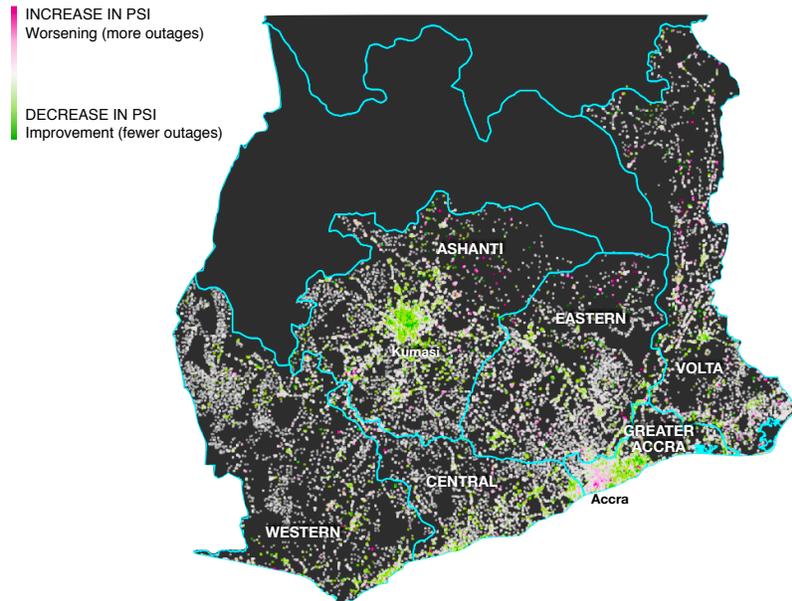
the peak of the power crisis in 2015 to 2017.

4   Analysis

Because of how the quality of existing services shapes the salience and expected returns on any new service delivery efforts, I expect that political leaders will scrutinize variations in service quality to identify opportunities to maximize the returns on their efforts. A straightforward hypothesis is that political leaders will target service provision to areas that are both electorally significant and have low service quality.

I begin by presenting graphical evidence in support of the claim that existing levels of service quality shape which areas are targeted by leaders with new services. The arrow plot in Figure 7 represents changes in the level of NPP support and PSI over time for each constituency. The start of each arrow is PSI in 2015 and NPP vote share in 2012, and the

Figure 6: Change in PSI (Power Supply Irregularity) Index in Ghana, 2015–17
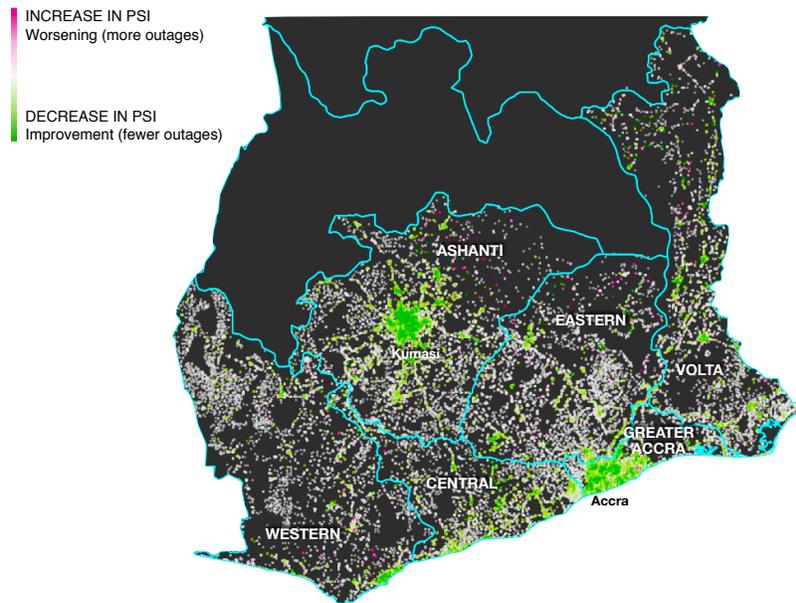

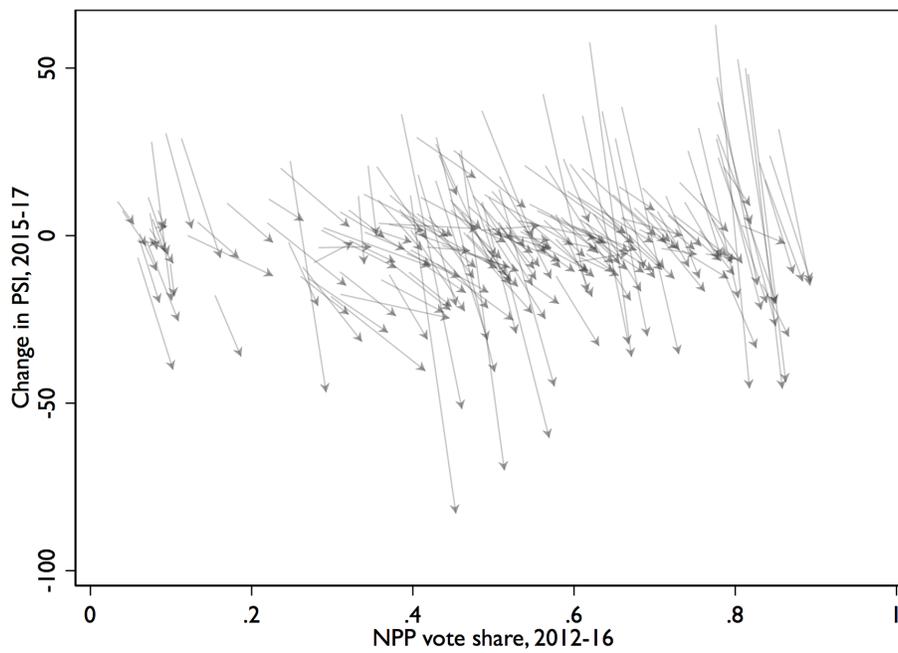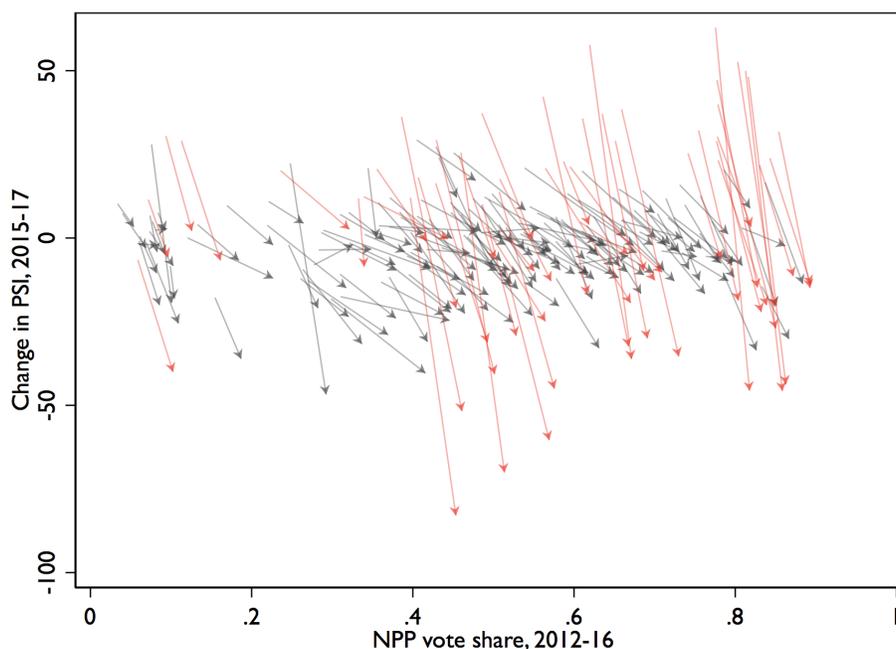Figure 7: NPP vote share and Change in PSI, 2015–17

Figure 8: NPP vote share and Change in PSI, 2015–17

Red arrows denote top 10% of constituencies with the steepest decline in electricity service quality in 2013-15 (i.e. greatest increase in PSI).

point of the arrowhead is PSI in 2017 and NPP vote share in 2016.

The generally positive movement along the x-axis is indicative of the increase in vote share received by the NPP in 2016 compared to 2012. The generally negative movement along the y-axis is due to a sharp decline in PSI in almost all constituencies, indicating a sharp decline in the intensity of power outages in most places.

Yet not all constituencies move the same way in the graph. Of the constituencies where PSI dropped the most, many of these constituencies are clustered in areas where the NPP barely won, or won by very large margins. This is consistent with the hypothesis that the highest improvements in service quality were targeted towards swing and core constituencies, as expected.

A further refinement of the data reveals an additional important trend in Figure 8. The

steepest declines in PSI (greatest improvements in service quality) occurred in areas where quality of service had worsened the most leading up to the peak of the power crisis. The red arrows indicate the top 10% of constituencies in terms of worsening service quality from 2013 vs. 2015.

This is not just a case of reversion to the mean. Service quality does not improve by the same magnitude for all areas that supported the NPP. Similarly, not all improvements in service quality happen in areas of NPP strength. Nevertheless, the patterns should be interpreted with caution because of the possibility of confounding. In particular, most of the biggest changes in PSI happened in Ghana's largest urban centers, Accra and Kumasi. One possible interpretation of the results is that changes in PSI were concentrated in these two cities. Yet even though parts of these cities are often considered as stronghold areas for the NDC or NPP, there is variation in electoral support across both cities.

To better account for potential confounders and other factors, I now turn to regression analysis. Results are presented in Table 1. The dependent variable in these models is the change in PSI from 2015-17.

Model 1 provides a test of the standard theory that service provision is targeted according to level of electoral support. The model shows strong support for the idea that areas that supported the NPP with more votes received improved electricity supply in the first year of the NPP presidency in 2017 relative to 2015.

Model 2 tests a technocratic model in which service quality improvements are targeted simply to areas with the worst quality of service. The model controls for PSI in 2015, to account for the quality of electricity service provision at the peak of the power crisis. The technocratic theory also finds strong support.

Model 3 includes both ruling party support and quality of service variables. The results now indicate that politics may not be important in shaping where services are provided, once you control for the quality of initial service provision. But it would be shortsighted

to draw this conclusion. The theory above argues that the quality of services shapes the political salience and expected return on investments into new service provision, which demands a different interaction model.

Model 4, the preferred model, now adds an interaction term for the quality of service provision and NPP support. The results show that improvements in electrical service quality from 2015-2017 were most pronounced in areas with the lowest service quality *and* had large numbers of NPP supporters. The main terms for service quality and NPP support now lose significance, implying that neither the quality of initial services nor the level of NPP support have a direct, independent effect on new service provision, but that they matter when considered together. The patterns captured in the model are plotted in Figure 9, which shows that the largest beneficiaries of new electrical service were areas of high NPP support and low initial service quality. The Appendix reports additional robust checks with alternative formulations of the dependent variable.

5   Conclusion

Drawing on new data on the quality of electricity supply across Ghana over a crucial five-year period, this paper presents initial evidence that the quality of services crucially shapes how political leaders think about whom and where to target with new service delivery efforts. Following the 2015 peak of Ghana's worst power crisis in history, the results show that improvements in electrical service quality from 2015-2017 were most pronounced in areas with the lowest service quality *and* had large numbers of NPP supporters. Once the interaction effect is included, neither of the main effects of initial service quality nor NPP support are significant. The findings underscore how omitting the pre-existing quality of services can lead to incorrect inferences about the logic of service delivery.

Figure 9: Predicted Improvements in Service Provision by Initial Quality of Service and Political Support
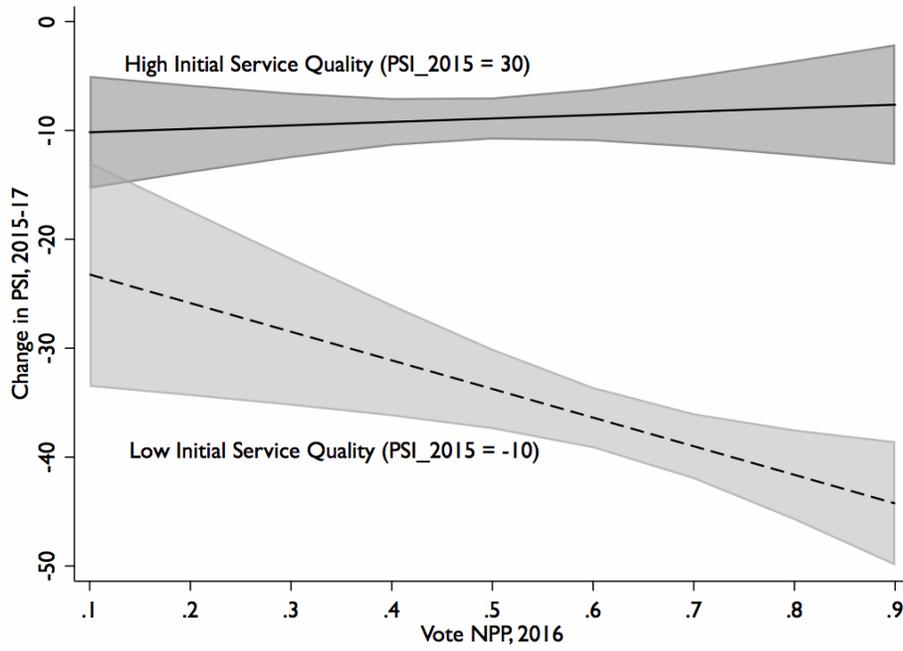
Predicted values based on Model 4. A decline in PSI indicates an increase in power supply reliability and fewer predicted power outages.

Table 1: Regression Results: Determinants of Electricity Service Provision

DV: Change in PSI, 2015-17	(1)	(2)	(3)	(4)
PSI_{2015}		-0.7290**	-0.7031**	-0.2529
		(0.059)	(0.065)	(0.160)
NPP Vote Share, 2016	-33.3159**		-8.3131	-4.1928
	(6.941)		(6.013)	(5.784)
$PSI_{2015} \times$ NPP Vote Share				-0.7365**
				(0.252)
Total Votes, 2016	-0.1343	0.0205	0.0347	0.0401
	(0.078)	(0.047)	(0.051)	(0.051)
Avg. Light Output, 2013	-0.0824**	-0.0696**	-0.0707**	-0.0690**
	(0.006)	(0.003)	(0.003)	(0.004)
Region FE	Yes	Yes	Yes	Yes
Constant	26.1649**	2.2256	7.6484	6.0355
	(5.098)	(2.126)	(4.526)	(4.286)
Observations	187	187	187	187
R-squared	0.736	0.871	0.873	0.883

Robust standard errors in parentheses
** pi0.01, * pi0.05

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Appendix: Alternative DV specifications

Table 2: DV is change in PSI, 2013–17

	(1)	(2)	(3)	(4)
PSI_{2013}		-0.4678**	-0.4674**	-0.1313
		(0.075)	(0.074)	(0.162)
NPP Vote Share, 2016	3.1251		2.7134	0.3823
	(5.519)		(4.864)	(4.911)
$PSI_{2015} \times$ NPP Vote Share				-0.6304*
				(0.268)
Total Votes, 2016	0.0108	0.0629	0.0554	0.0567
	(0.059)	(0.046)	(0.047)	(0.048)
Avg. Light Output, 2013	-0.0436**	-0.0543**	-0.0540**	-0.0535**
	(0.007)	(0.005)	(0.005)	(0.005)
Region FE	Yes	Yes	Yes	Yes
Constant	-4.6038	-0.7898	-2.5313	-0.7639
	(4.730)	(1.902)	(3.821)	(3.661)
Observations	187	187	187	187
R-squared	0.527	0.665	0.666	0.677

Robust standard errors in parentheses
** p¡0.01, * p¡0.05

Table 3: DV is PSI_{2017}

	(1)	(2)	(3)	(4)
PSI_{2015}		0.2710**	0.2969**	0.7471**
		(0.059)	(0.065)	(0.160)
NPP Vote Share, 2016	2.2443		-8.3131	-4.1928
	(6.195)		(6.013)	(5.784)
$PSI_{2015} \times$ NPP Vote Share				-0.7365**
				(0.252)
Total Votes, 2016	0.1061*	0.0205	0.0347	0.0401
	(0.052)	(0.047)	(0.051)	(0.051)
Avg. Light Output, 2013	-0.0658**	-0.0696**	-0.0707**	-0.0690**
	(0.004)	(0.003)	(0.003)	(0.004)
Region FE	Yes	Yes	Yes	Yes
Constant	-0.1701	2.2256	7.6484	6.0355
	(4.583)	(2.126)	(4.526)	(4.286)
Observations	187	187	187	187
R-squared	0.663	0.714	0.718	0.741

Robust standard errors in parentheses
** pi0.01, * pi0.05

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