The Distribution of Power: Favoritism, Efficiency, and Equity in Energy Infrastructure

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Abstract

Existing research demonstrates that political favoritism distorts the allocation of public investments. This paper builds on this rich literature by modeling the welfare gains from public investment under the observed, politically motivated allocation and comparing it to several counterfactual scenarios. Using granular infrastructure, electoral, and census data on Kenya's national electricity grid access project, we first show that areas with majority pro-government vote shares received 35-42% more household and village electrification relative to the stated formula legislated to promote equity. Yet perhaps surprisingly, we estimate that this deviation *increased* total consumer surplus by 2.3%. This came at the expense of opposition voters, who received 20.7% less surplus gain from the program on average than they would have if the allocation had followed the legislated formula. We then show that a counterfactual surplus-maximizing allocation is politically neutral. The observed deviation from the legislated formula also disproportionately disadvantaged households in the poorest income quintile, who received 12% less surplus than they would have under the stated allocation. Thus even though the deviation from the formula increased total surplus in this context, political bias in the observed allocation cannot be justified on the basis of surplus maximization nor legislated equity goals, and must be weighed against the potentially adverse long-term welfare impacts of heightened political and economic inequality.

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1 Introduction

Hon. Temporary Deputy Speaker,
I want to talk about fair distribution of power. As a country, we do not have enough power. However, there are some areas that are more equal than others. It is important that Kenya Power does not have political patronage so that it can distribute power without fear or favour. We will definitely move on to the next level if that happens. We have talked about developing this economy and that can only happen if those things are put in place.

— Robert Mbui, Opposition Member of Parliament
Kenyan parliamentary debates, 10 July 2013 (Hansard, 2013)

When citizens vote largely along ethnic-party lines, electoral accountability can be limited and public services may serve as tools for patronage. In Sub-Saharan Africa, the phrase "it's our turn to eat" has often been used to capture how a presidential election can lead to spoils for the supporters of the winner (Wrong, 2010). A large literature has quantified this type of political bias across a host of settings—see for example Burgess et al. (2015), Franck and Rainer (2012), Dickens (2018), Harris and Posner (2019), Asher and Novosad (2017), Francois, Rainer, and Trebbi (2015), Do, Nguyen, and Tran (2017), Pande (2003), and Rouanet, Tallec, and Alonzo (2025)—but most stop short of quantifying aggregate impacts on economic surplus. When considering the allocation of goods and public services, one might implicitly assume that, by deviating from a 'fair' allocation, political favoritism reduces aggregate welfare. However, depending on how the 'fair' counterfactual is defined, a politically motivated deviation could in theory increase total economic surplus or advance equity goals, depending on the characteristics and needs of the winning party's supporters.

This study makes progress on this subject by quantifying political favoritism and then integrating the resulting estimates into a formally grounded economic analysis to estimate its impacts on the magnitude and distribution of total surplus. In particular, this paper estimates favoritism and its effects on efficiency and equity in the context of Kenya's Last Mile Connectivity Project (LMCP), an ambitious initiative launched in 2016 to connect all households to electricity—and, at \$788 million, one of Kenya's largest public works programs.[1] In the early 2000s, Kenya underwent major decentralizing reforms dubbed the "biggest political transformation since independence" (Cheeseman, Lynch, and Willis, 2016), creating "arguably Africa's strongest parliament" (Opalo, 2014) and making it one of Africa's most democratic countries (Figure A1). These reforms include the 2003 Constituency Development Fund (CDF) Act, in which opposing political parties ratified a transparent formula to disburse treasury funds equally and equitably across Kenya's 290 constituencies. In 2010, Kenya's Assistant Minister for Energy and Petroleum stated in Parliament that the ministry allocates funding for rural electrification "using the CDF formula" (Hansard, 2010). Kenya Power, the government-controlled electric utility, later confirmed that "selection of the 5,320 distribution transformers for the [LMCP] was done using the CDF distribution formula" (Kenya Power, 2016).

[1] For comparison, Nairobi's expressway was projected to cost \$504 million (KNHA, 2022) and Kenyan government expenditure on secondary education in FY2021/2022 was \$521 million (GoK, 2021).

We combine village-level panel data on LMCP construction progress with the universe of Kenya Power's 7.4 million electricity meters and 62,271 electrical substations. We match these with granular results from Kenya's 2013 and 2017 presidential and parliamentary elections by administrative ward. This unusually rich data environment allows us to first estimate marginal favoritism relative to the CDF rule across four distinct stages of the electrification program: transformer construction, LMCP site selection, grid extension, and household meter activation. We then integrate the results into estimates of consumer surplus that incorporate Kenya National Bureau of Statistics microdata on income and electricity consumption across Kenya's 1,450 wards, electricity tariff data, and off-the-shelf demand elasticities. This approach allows us to estimate consumer surplus across the population under the observed allocation and three counterfactual scenarios, namely: the intended CDF allocation, the surplus-maximizing allocation, and a politically neutral surplus-maximizing allocation. By not assuming that the benchmark CDF allocation is welfare-maximizing, we allow for the more nuanced and realistic possibility that political favoritism can in some contexts even *increase* welfare. We then evaluate cost heterogeneity in construction by analyzing the actual contracts signed between Kenya Power and dozens of private sector contractors.

The first main result is that constituencies that voted pro-government in the preceding election received significantly more LMCP sites than their CDF share, while opposition constituencies received significantly fewer. As a result, by 2019 pro-government wards had 35% more new electricity meters per capita. These results are robust to a wide range of specifications and controls, including census data and measures of private sector economic activity. Favoritism is strongest in core support wards (where the government received at least 75% of the vote), but also large and significant in more heavily contested swing wards, regardless of whether they eventually voted for the government or the opposition.

In terms of mechanisms, the data are consistent with political favoritism being exerted primarily by central government officials. Pro-government areas saw 17% more initial construction of transformers, which was managed by the Ministry of Energy between 2008 and 2016. Kenya Power's selection of LMCP sites from among the set of existing transformers expanded the gap to a 42% difference in LMCP sites. The results show no evidence of subnational favoritism: within a constituency, wards that voted for or against the MP see similar levels of LMCP construction, and a close-election regression discontinuity design finds that presidential alignment of a constituency's MP does not affect electrification. Network construction and meter activation, which were managed locally, also exhibit no favoritism. These results suggest Kenya's constitutional decentralization reforms did not in practice successfully decentralize the electricity sector, despite local governments having been given an explicit mandate to conduct electricity planning.

The second main result is that this politically biased deviation from the announced policy rule *increases* aggregate consumer surplus. This possibly counterintuitive result comes from the disproportionate allocation of electricity meters towards higher-income households, who consume more electricity on average and thus experience higher consumer surplus once connected. A stylized model presents intuition for this result and explores other contexts where it may hold.

This empirical finding raises a critical question: was favoritism justified on the basis of surplus maximization, or could these efficiency gains have been achieved without political bias? More concretely, if connecting the marginal pro-government voter generates on average a larger surplus gain than connecting the marginal opposition voter, then political favoritism could be justifiable on the grounds of surplus maximization. To evaluate this, we use the favoritism estimates to generate several counterfactual allocations, guided by a conceptual framework that models the heterogeneous surplus gains from electricity access.

The third main result is that the surplus maximizing allocation of connections shows essentially no politically favoritism towards government supporters. In addition, the average surplus gain per connection is approximately equal across areas with different political affiliations, and construction costs are statistically indistinguishable across voting regions. The political bias in the observed allocation therefore does not appear to be justified on the basis of surplus maximization. Instead, the increased surplus generated by deviating from the CDF arises from the significant economic inequality across constituencies: per capita income is four times higher in the 90th percentile constituency than in the 10th percentile constituency, and 20 times higher in the wealthiest constituency than in the poorest constituency. By relaxing the need for near equal distribution across constituencies, deviating from the CDF enables the targeting of constituencies with households that have higher returns to electrification.

The modest aggregate surplus gain must furthermore be weighed against its political and distributional implications. Relative to the CDF allocation, opposition voters captured 10% less surplus while pro-government voters captured 13% more surplus, generating significant political inequity. The observed allocation also exacerbated income inequality, with the poorest income quintile gaining 12% less surplus gain than they would have had the legislative formula been followed. As implemented, the program generated 1.3 1.3 times more connections and 2.9 times more consumer surplus for the highest income quintile than for the lowest income quintile. This regressivity directly undermined the equity goals underlying the CDF, which the public statements suggested the electrification program was following. Taken together, the political bias in the observed allocation does not appear to be justified on the basis of either efficiency or equity. More speculatively, to the extent that political and economic inequality undermines long-term economic growth, any modest gains in aggregate economic surplus may not be worth the political discontent they may generate through the uneven distribution of resources.

A longstanding literature quantifies political favoritism in the provision of public goods and services to government supporters and opposition groups across a range of contexts (such as Ferejohn (1974), Michalopoulos and Papaioannou (2016), Curto-Grau, Solé-Ollé, and Sorribas-Navarro (2018), Harris and Posner (2019), Asher and Novosad (2017), Ferraz and Finan (2008), and Rouanet, Tallec, and Alonzo (2025)), as well as contexts where political alignment is largely coethnic such as Casey (2015), Burgess et al. (2015), Franck and Rainer (2012), Posner (2005), Dickens (2018), and Francois, Rainer, and Trebbi (2015). However, few papers evaluate the welfare consequences of political favoritism. This paper expands this literature by integrating estimates of political bias into a formally grounded notion of economic surplus to evaluate the impacts of such favoritism on both efficiency and equity goals.

Understanding the consequences of political favoritism in the energy sector is especially critical as ambitious global decarbonization goals drive trillions of dollars of investment into electric grids (IEA, 2024). In particular, low- and middle-income contexts often face potential tensions between equity and efficiency goals: many utilities are under pressure to provide affordable, universal access to electricity (Burgess et al., 2020; Blimpo and Cosgrove-Davies, 2019), with many offering costly, inefficient, and often politically motivated subsidies (Mahadevan, 2024; Kojima and Trimble, 2016). Kenya is a useful context to study the interplay of these issues: Kenya Power has grown from having fewer than 1 million residential customers in 2008 to 9.7 million by 2024 (Kenya Power, 2013, 2024), and Kenya is a regional leader in decarbonization, with 20th-percentile emissions of CO_2 per dollar of GDP (Kenya Power, 2023; World Bank, 2016) and 89% of its grid powered by hydropower, geothermal, and wind. Centrally managed grids—including those of Kenya and of more than 80% of countries in Africa—might more efficiently locate and deploy generation and expand transmission networks (Welton, 2024; Cicala, 2022; Botterud et al., 2024). At the same time, centralized management may exacerbate political distortions that undermine electric utilities' ability to manage the global energy transition (MacLean et al., 2016; Min, 2019; Briggs, 2021; Hausman, 2025).

Energy infrastructure is part of a broad class of public investments whose economic returns appear to *increase* with the incomes of the recipient, creating an inherent efficiency-equity trade-off. Research on place-based policies often highlights this trade-off: public expenditures on, for example, broadband, airports, electric vehicle charging stations, or higher education often generate larger welfare gains when implemented in wealthier places (Glaeser, 2008; Gaubert et al., 2025; Muehlegger and Rapson, 2022). Benabou (2000), Guerreiro, Rebelo, and Teles (2021), and Herwartz and Theilen (2017) have similarly identified a class of public investments that generate large aggregate welfare gains for society but worsen outcomes for the poor. Even cash transfers can exhibit regressive returns when the poor face structural barriers to accessing capital or education (Haushofer et al., 2025; Daruich and Fernández, 2024). While we find that political favoritism was not justifiable on the grounds of surplus maximization in this paper, it may be in other settings where recipients' incomes and political alignment are more strongly correlated.

Finally, this research contributes to a body of work on decentralization, which investigates its effects on corruption, the quality of public goods provision and intrastate conflict across dozens of countries.[2] The results highlight the critical role of institutional design in effective decentralization: given the continued centralized management of the power sector in most countries, these results may have important implications for the political economy of the global energy transition.

[2]See Ostrom, Tiebout, and Warren (1961), Prud'homme (1995), Fisman and Gatti (2002), Brancati (2008), Fedelino and Ter-Minassian (2010), Alatas et al. (2012), Opalo (2014), Mookherjee (2015), Savage and Lumbasi (2016), Rodríguez (2018), Opalo (2020), Hassan (2020b), Hassan (2020a), Hamidi and Puspita (2022), Rajasekhar (2021), and Faguet and Pal (2023).

2 Electrification in Kenya

In 2009, only 23% of all Kenyan households and 5% of rural households had access to grid electricity.[3] The Government of Kenya (GoK) has since directed significant funding towards universal electrification. Following the 2008 launch of the Rural Electrification Authority's project to electrify thousands of public facilities, in 2016 the GoK announced the Last Mile Connectivity Project (LMCP). The LMCP aimed to connect millions of rural Kenyans to the grid between 2016 and 2022 at a cost of USD 788 million (REA, 2015; Kenya Power, 2018). These programs, which raised household electricity access to more than 50% by 2019, took place largely after major, government-wide decentralization reforms had taken place between 2003 and 2010. This section discusses these developments in more detail.

2.1 Decentralization and the Constituency Development Fund

Decentralization—the re-allocation of political and fiscal power away from the central executive—has been a major feature of Kenyan democratization, and has helped make Kenya's democratic institutions among the strongest in Sub-Saharan Africa (Figure A1). A key milestone in the reform process was the 2003 Constituency Development Fund (CDF) Act, enacted after President Arap Moi's 24-year rule came to an end in 2002 when Kenya's main opposition party—led by Mwai Kibaki—had won the presidential and parliamentary elections. The CDF Act was supported by members of both government and opposition parties—including Raila Odinga, the subsequent leader of the opposition in the 2007, 2013, and 2017 national elections—to help constrain future political favoritism.[4]

The CDF Act was designed to increase equity: to "promote the national values of human dignity, equity, social justice, inclusiveness, equality, human rights, non-discrimination and protection" and to "provide for a public finance system that promotes an equitable society and in particular expenditure that promotes equitable development of the country" (GoK, 2016). To do so, the Act established a transparent formula: 75% of CDF funding would be allocated in equal shares across all constituencies (regardless of population) and 25% according to that constituency's share of national poverty (GoK, 2003). A 2016 revised version amended the allocation: each constituency would now receive an equal share, though in practice this change in the formula was both economically and statistically small (GoK, 2016). In a recent review, the Minister for Energy described the 2003 CDF Act as "one of the greatest innovations that we have done in this Parliament" (GoK, 2024).

A second milestone of decentralization was the adoption of the 2010 Constitution after a national referendum. Among other reforms, it created an entirely new layer of government: 47 counties with significant political and fiscal independence. This included popularly elected governors for the first time, as well as county assemblies elected across 1,450 newly created electoral wards. The new constitution also increased the number of constituencies from 210 to 290. These legislative and

[3] Figure A2 shows the number of meters per household by wards per Kenya Power's residential meter data.

[4] After controlling for basic census variables, allocations are uncorrelated with political affiliation, while without controls, they lean very slightly towards pro-opposition areas, which tend to be somewhat poorer (Table B1).

constitutional changes devolved resources and power toward local politicians, with the intent to "diffuse, if not eliminate altogether, the ethnic tensions fueled by perceptions of marginalization and exclusion" in national politics (Akech, 2010).

2.2 Kenya's political backdrop

Uhuru Kenyatta was the incumbent president during the launch of the LMCP in 2015. He had earlier joined Kibaki's winning coalition in the 2007 election, which, after a disputed result, saw widespread violence in which an estimated 1,500 Kenyans were killed (Leonard, Owuor, and George, 2009; Cheeseman, 2008). In the aftermath, key figures—including Kenyatta and William Ruto, who had previously been on opposite sides but joined forces in the subsequent 2013 national election—were charged with crimes against humanity by the International Criminal Court. Their political alliance strengthened in the years after, forming what became known as the "coalition of the accused" (Shilaho, 2016; The Economist, 2013).

This main explanatory variables in this paper's analysis are voting outcomes from the 2013 presidential election, which preceded the selection of LMCP sites. Uhuru Kenyatta won the March 2013 presidential election with an electoral coalition similar to Kibaki's in 2002 and 2007, drawing significant support from central Kenya. Kenyatta's partnership with Ruto also gained him significant support in the west-central Rift Valley region, where Ruto's main political base resides. Raila Odinga led Kenya's opposition with support located primarily in western regions of Kenya and some urban centers. The electoral map in panel A of Figure 1 shows this geographic variation.

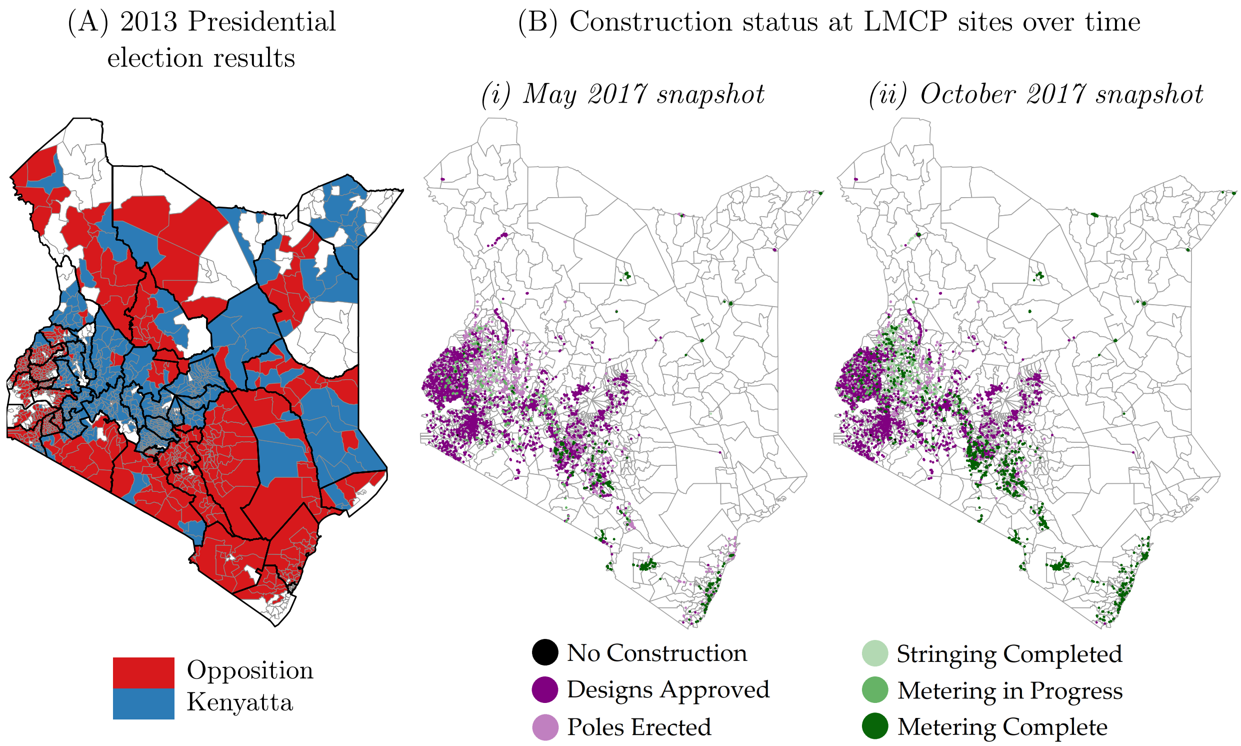
In 2008 President Kibaki had launched a program to connect public buildings such as schools and health centers to electricity. After being elected in 2013, Kenyatta expanded this program to target universal household electricity access. Despite increasing scrutiny surrounding ethnicity within public sector appointments (Amaya, 2016; Simson, 2018), both Kenya Power managing directors appointed under Kenyatta in 2013 and in 2017 were politically aligned with his coalition (Figure A3 provides an overview of appointments). Electrification efforts accelerated in the year before the August 2017 presidential election, with more than a million new residential electricity meters installed over this period. In a March 2017 State of the Nation address, Kenyatta stated:

> "To begin the walk towards industrialisation, we needed to drastically improve and expand our infrastructure, and to increase access to electricity... In 2013, we promised to provide access to electricity for 70% of all households by the end of 2017. Today, we have connected an additional 3.7 million new homes to electricity. We have more than doubled the total number of connections made since independence." (Kenyatta, 2017)

Kenyatta won the August 2017 election but Kenya's Supreme Court annulled the results due to alleged irregularities, confirming both the strengths of Kenya's democracy (as the judiciary was able to force an election re-run) but also its limitations (the lack of fully transparent polls).[5] After

[5] The October 2017 re-run was boycotted by the opposition. The August 2017 results, while also imperfect, thus better reflect the contours of regional electoral support and these are used in the analysis.

Figure 1: 2013 election vote shares and nationwide distribution of LMCP construction



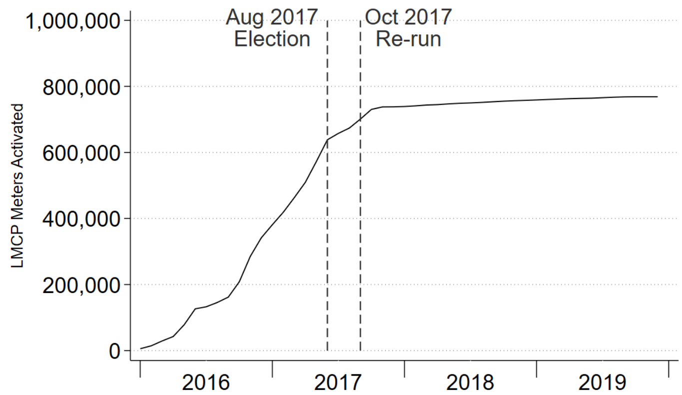
Note: Panel A shows 2013 presidential election results at the ward level, with county borders in thick black lines: blue (red) wards had vote shares of over (under) 50% for Kenyatta, white wards are missing election data. (Figure A4 presents the full distribution of vote shares and separates interior and border regions of support; Figure A5 maps the distribution of LMCP sites in an example border area). Panel B shows two snapshots from monthly construction data, showing the status of construction at each LMCP transformer site. The full monthly panel data set spans from April 2017 to June 2019.

winning the November 2017 re-run, Kenyatta was sworn in to his second term on November 28, 2017. Kenyatta's Jubilee Party won 140 out of 290 MP seats in the National Assembly, while Odinga's Orange Democratic Movement won 62.

This paper's main analyses study the relationship between electrification project placement and the 2013 election results, rather than the 2017 results, for two main reasons. First, the 2017 results might be endogenous to the placement of electricity infrastructure if those investments influenced voting. Second, the spatial distribution of electoral support in Kenya is highly persistent over time: the 2013 and 2017 elections are correlated with an R^2 of 0.89 (Figure D1). The 2013 election results thus reflect the prevailing political landscape during the 2016–2017 rural electrification program.

Figure 2 plots the cumulative number of activated LMCP meters based on their activation dates provided by Kenya Power. Between the start of LMCP in 2016 and the October 2017 presidential election re-run, there was rapid progress in construction, with over 30,000 meters activated per month. However, after the August election and the October re-run there was a noticeable plateau in the pace of construction for at least two years. These patterns suggest the presence of political forces—in particular, the ramp-up before the election is consistent with strategic behavior designed to incentivize voting *ex ante* (Golden and Min, 2013).

Figure 2: Household electricity meters activated under the Last Mile Connectivity Project



Count of LMCP meters (Section 3 defines an 'LMCP meter') over time. The vertical lines denote the August 2017 and October 2017 presidential elections. Figure A6 disaggregates construction per capita by political affiliation.

2.3 Rural electrification in Kenya

In 2008, Kenya's electricity grid had around 30,000 electrical transformers. Transformers convert medium voltage electricity down to low voltage (LV), which can be used by households and businesses. Between 2008–2015, thousands more transformers were installed across the country. This greatly reduced the marginal cost of household connections, and motivated the launch of the LMCP, a rural household connectivity program. In 2016, several thousand transformers were selected for the LMCP (termed 'LMCP transformers' or 'LMCP sites'). The LMCP's goal was to leverage economies of scale and connect all households within 600 meters of a transformer in a single process referred to as 'transformer maximization'. Most LMCP sites contained between 20 to 100 unconnected households. This section describes the four stages of this process in more detail. Panel B of Figure 1 shows the geographic distribution of construction progress across these four stages.

Stage 1: The installation of new transformers

The first major hurdle to increasing rural electricity access was the lack of transformers in rural areas. In its 2008 Strategic Plan, the Rural Electrification Authority (REA) announced that it would install thousands of transformers across the country with the goal of connecting secondary schools, trading centers, and health and water centers to electricity (REA, 2008; Berkouwer, Lee, and Walker, 2018). In part as a result, the number of distribution transformers nationally more than doubled: installed capacity of 11/0.415kV and 33/0.415kV distribution transformers increased from 3,515 MVA in June 2007 to 7,276 MVA in June 2017 (Kenya Power, 2012; 2017).

Stage 2: The selection of LMCP sites from among the nationwide set of transformers

Based on primary reads of original correspondence between Kenya Power and individual members of parliament, we determined that Kenya Power first set a target budget for each constituency. Kenya Power then reached out to each constituency's member of parliament and exchanged a series of letters to jointly select which transformers in that constituency would be maximized under LMCP.

A total of 13,840 transformers were selected for maximization. The list of these LMCP villages was shared publicly (Kenya Power, 2017; Kenya Power, 2015).

Stage 3: The construction of low voltage network expansions at LMCP sites
Construction at villages selected for the LMCP was outsourced to private contractors, with staff at Kenya Power's Nairobi headquarters implementing auctions and administering dozens of contracts (Wolfram et al., 2023). The selected contractors—a mix of domestic and international firms—were responsible for designing low-voltage network expansions, procuring materials (such as poles and conductors), and installing them. Installation consisted of three steps: erecting poles, stringing (wiring) poles, and connecting a drop cable from a pole to each customer.

Importantly, implementation contracts were segregated geographically, with each contract assigning responsibility for LMCP sites in at most a handful of geographically clustered counties.[6] As a result, contractors often had staff based in smaller cities, who interacted primarily with local Kenya Power offices. This becomes a notable detail later when discussing the role of decentralization.

Stage 4: The activation of household electricity meters at sites with construction
Connecting a household to the grid requires both physically installing a meter and activating it with a customer account. While contractors were responsible for the physical connection and meter installation, Kenya Power was responsible for meter activation.

Program beneficiaries were not required to pay an upfront deposit: per Kenya Power, "all the beneficiaries under this scheme will be connected" (Kenya Power, 2016). While there was a nominal connection fee of KES 15,000 (∼USD 150)—significantly lower than the standard KES 35,000 (∼USD 350) fee, thanks to government and donor financing—households connected under the LMCP could pay this in up to 36 monthly installments of around USD 4 each; in practice many fees were never recovered.[7]

[6] Both the African Development Bank (AfDB) and World Bank (WB) were major donors. The contracts funded by the AfDB and the WB were spatially interspersed and both broadly nationally representative and this difference thus does not affect the political analysis (Wolfram et al., 2023). The results in this paper are similar when considering only AfDB sites or only WB sites.

[7] Monthly payments were supposed to have been automatically posted to households' electricity meters, but in practice, connection fees for many customers were never or only partly recovered (Alushula, 2018). This structure was later changed to a 20% upfront payment, with the balance recouped by dedicating 50% of households' monthly electricity expenditures to repaying the connection fee (AfDB, 2022).

Cumulative favoritism

The marginal impacts across these four stages determine the cumulative number of LMCP household electricity meters per 100,000 households. Equation 1 formalizes this measure of favoritism:

$$\begin{aligned}\frac{\text{\# LMCP household electricity meters}}{\text{100,000 households}} = & \left(\frac{\text{Total \# transformers}}{\text{100,000 households}}\right) \\ & \cdot \left(\frac{\text{\# LMCP transformer}}{\text{Total \# transformers}}\right) \\ & \cdot \left(\frac{\text{\# LMCP transformers with LV construction}}{\text{\# LMCP transformers}}\right) \\ & \cdot \left(\frac{\text{\# LMCP household electricity meters}}{\text{\# LMCP transformers with LV construction}}\right) \qquad (1)\end{aligned}$$

2.4 Use of the CDF formula to allocate electricity grid investments

A central contribution of this paper is estimating favoritism against a counterfactual that reflects the government's apparent welfare goals. Over a period of several years, the Ministry of Energy consistently stated that in order to achieve an equitable allocation of rural electrification investments, expenditures for both the construction of transformers and for household connections were to follow the 2003 Constituency Development Fund (CDF) formula, which had been determined well before REA and LMCP electrification programs launched in 2008 and 2015. Consider the following exchange during a 2010 parliamentary session, at the start of REA's transformer construction program:

> Evans Bulimo Akula, Opposition Member of Parliament:
> *Mr. Speaker, Sir, how many projects is the Ministry supposed to do in every constituency per year? For the last eight years, they have done only 11 projects.*
> [...]
> Charles Keter, Assistant Minister for Energy and Petroleum:
> [...] *we are using the CDF formula. The hon. Member will realise that in this financial year, he will get over Kshs15 million and we are doing about five projects. In the last financial year, he also got the same amount of money, that is, Kshs15 million which did three projects. Right now, the Ministry of Energy allocates funds using the CDF formula.*
>
> Kenyan parliamentary debates, 25 March 2010 (Hansard, 2010).

The LMCP was similarly described as a policy to advance economic equity. A "Last Mile Connectivity Program Q&A" section on Kenya Power's website for example stated that "the selection of the 5320 distribution transformers for the first phase was done using the CDF distribution formula" and that this was done "in the spirit of equitable distribution of resources" (Figure A7).

In 2016, President Kenyatta stated, "Every Kenyan who needs electricity must be connected. The days when electricity was a preserve for the well to do is long gone. The approach we are taking will bring equality," with Charles Keter, Assistant Minister for Energy and Petroleum, adding, "Previously electricity was a privilege enjoyed by the rich people now the President has instructed us to ensure that we do not segregate" (Bungane, 2016). This was motivated by development goals for the lowest-income Kenyans, with the GoK saying for example that "improved access to energy sources especially electricity improves human development conditions" (Ministry of Energy, 2015) and that "accelerating the pace of electrification in line with the government's target of 70 percent electrification by 2017 can contribute to eliminating extreme poverty" (Treasury, 2020).

In a parliamentary session in Nairobi in 2016, an opposition member of the senate asked "why the Government is discriminating against sections of the public in terms of the allocation," in response to which a member of government provided the following statement:

> Senator Mwakulegwa, Vice-Chairperson in the Standing Committee on Energy:
> *The company is not discriminating against any section of the public in terms of their location... The company has ensured that the ongoing projects are supported by donors and the Government and are spread throughout the constituencies and counties using the Constituencies Development Fund (CDF) distribution formula.*
>
> Kenyan parliamentary debates, 14 June 2016 (Hansard, 2016).

Throughout this period, Kenya Power's public materials also all stated that it would allocate LMCP sites to constituencies according to the CDF formula: Kenya Power's web page electrification information page for example stated that "selection of the distribution transformers for the Last Mile project was based on the Government Constituency Development Fund criteria for resource allocation" (Kenya Power, 2024).

3 Data

A key feature of this paper is the granularity of the data on both grid infrastructure (provided by Kenya Power) and construction progress over time (provided by LMCP project contractors). We combine this with detailed ward-level electoral data, constituency-level household income and electricity spending data, and county- and national-level expenditures in the energy sector. Together, these data provide a detailed understanding of Kenya's rural electrification activities, electoral outcomes, and public expenditures between 2008-2019, across Kenya's 47 counties, 290 constituencies, and 1,450 electoral wards.

3.1 Grid infrastructure and LMCP construction data

The grid infrastructure data provided by Kenya Power include the universe of Kenya's 7 million electricity meters and the 62,271 transformers that they were connected to as of December 2019, with geo-spatial coordinates and network connections for each meter and transformer, spanning all of Kenya (Table B2 provides summary statistics). Since the LMCP was a program of transformer maximization, it deprioritized sparsely populated regions and densely populated urban regions, and we exclude these from the analyses.[8] The main analyses thus focus on a sample of 911 rural wards that were the main focus of the LMCP (Figure A8). These 911 wards contain 42,135 transformers—including 9,284 out of the 11,934 transformers that were selected for the LMCP (78%)—and 840,548 household meters that are indicated as having been connected via a government electrification program since 2016.[9] For the remainder of the paper, we refer to these 911 wards as 'LMCP wards', the 9,284 transformers as 'LMCP sites', and these 840,548 electricity meters as 'LMCP meters'.

More than 99% of LMCP construction by 2019 was part of one of three programs co-financed with major international funders: African Development Bank (AfDB) Phase I, AfDB Phase II, and World Bank (WB), which through the end of 2019 incurred a combined cost of (Auditor-General, 2023) The construction progress panel data consist of monthly transformer-level construction progress reports—which contractors were mandated to send to Kenya Power—for all LMCP sites that were financed through either AfDB Phase I or WB.[10] The data contain four markers of progress: the start of construction, pole installation, stringing of electrical cables, and meter installation. Panel B of Figure 1 shows two snapshots of these data. The activation of household meters—when electricity actually begins to flow to households—is completed by Kenya Power and thus not included in the contractor progress reports. Instead, we construct a panel dataset of meter activation using the activation dates from the Kenya Power data (Appendix E provides additional detail on data construction). We also obtained copies of the signed contracts between Kenya Power and all of the contractors, allowing us to estimate heterogeneity in construction costs.

The various data sources generally align well. As an example, the meter activation database shows on average three to five household connections prior to construction, with a sharp rise of around 25–30 newly activated meters in the weeks around when a contractor independently reports completion of construction at a site (Figure A9). This is in line with Kenya Power's ex ante expectations around the likely number of ex ante connected and unconnected households at each site (Kenya Power officials confirmed that, prior to the LMCP, up to a handful of high-income households would have been connected by paying the standard connection fee).

3.2 Electoral data

Panel A of Figure 1 displays ward-level results for Kenya's 2013 presidential election, obtained from the Independent Electoral and Boundaries Commission website. Blue wards are those where

[8] We label counties targeted by REA's Kenya Off-Grid Solar Access Project as sparsely populated. In these remote areas, very few households lived within 600 meters of a transformer. We label wards in Nairobi or Mombasa, or with similar population density, as urban. By 2016, 84% of urban Kenya households were connected to electricity (WB, 2018). Figure D2 presents a specification curve with 63 variations of sample definitions. Results are not qualitatively sensitive to the sample definition.

[9] In line with Kenya Power explanations, we define this as having a pre-paid residential meter that was activated after 2015 as part of a government-funded scheme. Appendix E describes data construction in detail.

[10] We observe locations for all meters as of December 2019, but we only observe construction activity and activation dates for meters that had been activated by December 2017 or earlier as part of AfDB Phase I and WB. This limitation does not affect the main econometric analysis below.

Kenyatta won over 50% of the vote, while red wards are those where the opposition won over 50%.[11] Votes for Kenyatta's government were concentrated in central and west-central Kenya, covering the ethnic home areas of Kenyatta and Ruto, as discussed in Subsection 2.2. Electoral coalitions and geographic patterns in vote shares were stable between 2013 and 2017 (Figure D1).

As a robustness check, we restrict the sample to wards that geographically border at least one ward that voted for the opposing candidate in the 2013 presidential election, thus comparing only wards with relatively similar geographic and socioeconomic characteristics. This also accounts for baseline differences in the extent of the national grid, which can affect the cost and feasibility of local network extensions. This results in a sample of 451 adjacent wards (panel C of Figure A4).

3.3 Demographic and socio-economic data

The welfare analysis uses data from the Kenya National Bureau of Statistics. We first predict the joint distribution of income, pre-LMCP electricity connection status, and electricity consumption conditional on having a connection within each constituency. Following the literature, we then assume a Pareto income distribution to map ward-level consumption and GINI measures from the census data (KNBS, 2009) onto ward-specific household income distributions (Lubrano, 2017). Specifically, to estimate the Lorenz curve we define the distribution's shape parameter α as a function of the GINI index ($g = \frac{1}{2\alpha-1}$) and calculate the cumulative share of income $L(p)$ for each percentile $p \in [0, 1]$:

$$L(p) = 1 - (1 - p)^{(\alpha-1)/\alpha}$$

We calibrate these to ward-level minimum and mean household incomes.

The 2009 census data provide ward-level electrification rates. Reassuringly, these are highly correlated with the rates we compute using the Kenya Power meter data and ward-level household count after adjusting for population growth ($R^2 = 0.75$ at the ward level, 0.83 at the constituency level; Figure A10). We use the 2016 Kenya Integrated Household Budget Survey (KIHBS, 2016) to recover the pre-LMCP relationship between income and household propensity to have an electricity connection and to map incomes to estimated electricity expenditures conditional on having a connection, both at the household level.

Mapping electricity expenditures to electricity consumption is less straightforward: Kenyan electricity tariffs saw significant changes over this time period, with for example announcements about monthly fixed charges and monthly connection deductions that frequently did not align with on-the-ground reports of actual purchases. To map electricity expenditures to electricity consumption among the rural Kenyan population, we analyze electricity payment receipts, which averaged a price of USD 0.18 per kWh at the time (Berkouwer et al., 2023).

[11] 2013 election data are missing for 185 out of 1,450 wards (13%), shown in white in Figure 1. These are primarily located in remote northern regions of the country with relatively small populations and fewer LMCP sites.

3.4 Additional data

We draw additional ward-level socio-economic controls from the 2009 Kenya Population and Housing Census, which was the most recent census before the launch of LMCP (GoK, 2009). These include population density, baseline share of households that are unconnected to the grid, and household asset proxies. In addition to these socio-economic controls, we include geographic controls for land gradient and land area, as on average opposition wards have slightly less rugged terrain (as measured by a satellite-based gradient index) and larger land area, which could potentially affect construction costs.

While Kenya Power was planning and rolling out the LMCP, the private firm Safaricom was heavily expanding its network of M-PESA mobile money agents across the country. We therefore supplement the census data with geo-tagged data on the roll-out of M-PESA agents between 2013–2015. We interpret these data as an indicator of private sector economic activity and investment.

To understand the extent of decentralization in public expenditures in Kenya, we collect realized 2015 Constituency Development Fund (CDF) allocations (GoK, 2015) as well as total and energy-specific sub-national government expenditures (Kenya's Office of the Controller of Budget, 2022) for each county (Figure A11). At the national level we collect data on 2021–2022 ministerial expenditures by the ministries of health, agriculture and livestock, education, water and sanitation, roads and transport, and energy (GoK, 2022).

4 Favoritism in the rural electrification program

How much did Kenya's household electrification program favor areas that voted for Kenyatta, the winner of the previous presidential election? We first document the overall difference in household electrification using a selection-on-observables approach. Then, to distinguish favoritism from other possible government objectives, we evaluate the observed allocation relative to the Constituency Development Fund (CDF) formula.

4.1 Selection-on-observables estimation

The difference in electricity meters per 100,000 households between pro-government wards and opposition wards is estimated as follows:

$$y_i = \beta_0 + \beta_1 ProGovernment_i + \boldsymbol{\gamma}\mathbf{X_i} + \varepsilon_i \tag{2}$$

where y_i is the number of government-subsidized household electricity meters per 100,000 households activated in ward i as of December 2019. (For scale, Kenyan constituencies outside the major cities have an average population of around 27,000 households.) $ProGovernment_i$ equals 1 if ward i voted pro-Kenyatta in the 2013 presidential elections—as discussed in Subsection 2.2, the 2013 presidential elections result is the preferred explanatory variable (rather than 2017). $\mathbf{X_i}$ is a vector of covariates that varies across regressions.

Table 1: Political favoritism in household electricity connections per 100,000 households

	In absolute terms			Relative to CDF Allocation		
	(1)	(2)	(3)	(4)	(5)	(6)
Voted pro-govt in 2013	3188***	3092***	3613***	5639**	5285**	5045***
	(1008)	(1159)	(805)	(2062)	(2364)	(1609)
Observations	911	911	911	196	196	196
Opposition Mean	14444	14444	14444	16299	16299	16299
Effect Size (%)	22	21	25	35	32	31
Controls	None	SES	LASSO	None	SES	LASSO
Sample	Wards	Wards	Wards	Consts	Consts	Consts

In Columns 1–3, i is a ward and y_i is the number of government-subsidized household electricity meters per 100,000 households, with standard errors clustered by constituency. In Column 4–6, i is a constituency, and y_i is that same number minus the hypothetical number had meters been allocated according to the Constituency Development Fund (CDF) formula. Columns 2 and 5 control for land gradient, population density, baseline share of households that are unconnected, share adults with primary or secondary education, share adults who work for pay, dependency ratio, share households with an iron roof, household size, mobile money agents as of 2013 per capita, and change in mobile money agents between 2013 and 2015 per capita. Column 3 uses post-double selection LASSO (Belloni, Chernozhukov, and Hansen, 2013; Ahrens, Hansen, and Schaffer, 2020) to flexibly select from a subset of quadratic and cubic terms and interactions between this same set of variables. Table B4 presents the same analysis for LMCP sites per 100,000 households. Figure D2 and Figure D3 present specification plots with 63 different specifications varying sample and controls. $^{*} \leq 0.10,^{**} \leq .05,^{***} \leq .01$.

Column 1 of Table 1 presents results first without any socio-economic or geographic controls. Wards that voted pro-Kenyatta in the 2013 election saw more than 3,000 more active electricity meters per 100,000 households compared to wards that voted for the opposition. Relative to the 14,500 meters activated in opposition wards, this is a sizable 21% partisan gap. In other words, wards that voted pro-Kenyatta appear to have been significantly favored in the deployment of household electricity connections.

Of course, this initial regression may not accurately identify political favoritism if there are systematic differences between pro-Kenyatta and opposition areas that could account for uneven rates of electrification. If, say, pro-Kenyatta areas are on average richer, and the economic returns of electrification increase with wealth, targeting pro-Kenyatta areas may be economically sensible. Gaps in electrification rates that are correlated with political affiliation could in that case be justified by a welfare-maximizing social planner, as discussed further below.

To begin to address this, Column 2 of Table 1 adds a large set of socio-economic and geographic controls (detailed in the table note). This does not substantially move the coefficient. Similarly, Column 3 shows that using LASSO to flexibly select from the quadratic and cubic transformations and double and triple interactions of these controls does not meaningfully alter the coefficient estimate. It moves the point estimate slightly—which may be expected since government support is correlated with certain socio-economic outcomes—but the magnitude remains similar.

The main finding persists: electoral wards that voted pro-Kenyatta in 2013 saw substantially more electricity metering than opposition-voting wards, on the order of between 21–25%. The stability of the coefficients even when introducing a wide range of controls suggests that the observed political gaps do not merely reflect observed socio-economic or geographic differences. Results are qualitatively similar across a wide set of robustness checks.[12]

Even though favoritism does not appear to be correlated with contemporaneous economic outcomes, it could still be driven by other factors, such as expected growth: the government may have used private information about the potential for economic growth, not captured in the census data, to allocate electrification projects. To assess this possibility, we conduct a placebo test using data on the penetration of M-PESA mobile money agents—which are widely used for financial transactions in Kenya—as a proxy for expected growth in local economic activity. M-PESA expansion should reflect private sector expectations about regional growth trajectories. If electrification was targeted based on economic growth potential, the allocation of mobile money agents across space would thus exhibit similar pro-Kenyatta bias.

Repeating the analyses in Table 1 but replacing the dependent variable with the change in M-PESA mobile money agents between 2013 and 2015, M-PESA expansions do not appear to favor pro-Kenyatta areas (Table B5). Similarly, the allocation of LMCP sites shows a pro-Kenyatta bias even when measured relative to the share of mobile money agents, or against the 2013-2015 growth in the number of mobile money agents (Figure A12). Taken together, these results suggest that the pro-Kenyatta bias in LMCP sites is unlikely to result from underlying differences in the levels or growth of economic activity.

4.2 Estimating favoritism against the Constituency Development Fund formula

The results above indicate a strong bias towards pro-Kenyatta areas in Kenya's nationwide rural electrification program, even after controlling flexibly for a host of socio-economic and geographic characteristics. Still, a well-known limitation of using selection-on-observables approaches is that other unobserved factors could have driven favoritism. For example, if the government has an idiosyncratic objective function that is unobserved by the researcher, and this objective happens to correlate spatially with political affiliation, then differences that align with political affiliation may not reflect partisan favoritism.

This paper addresses this common identification concern by leveraging a unique feature of the setting: a transparent, equitable, and well-known benchmark against which to measure favoritism. As discussed in Subsection 2.1 and Subsection 2.4, officials from the Ministry of Energy and Kenya Power publicly announced that the well-known Constituency Development Fund (CDF) formula was to determine the allocation of LMCP funds across constituencies. Since there were no systematic construction cost differences (as we discuss in Subsection 6.3), this suggests that the allocation of transformer construction and LMCP connections should also follow the CDF formula.

LMCP sites were selected in 2015, when the original 2003 CDF formula was in effect, which stated that 75% of CDF funding was to be split in equal shares across all constituencies, with

[12] For instance, Column 2 of Table 1 is similar to Column 1 of Table B3 (using panel data) and Column 7 in Table D6 (without population weighting), Table D7 (among only adjacent wards), and Table D8 (per capita). Figure D2 and Figure D3 present specification plots with 63 different specifications varying sample, controls, and level of analysis.

the remaining 25% allocated based on each constituency's share of national poverty (GoK, 2003). Given the government's commitment to following the non-partisan CDF rule, deviations that are correlated with political affiliation are natural to interpret as evidence of political favoritism.

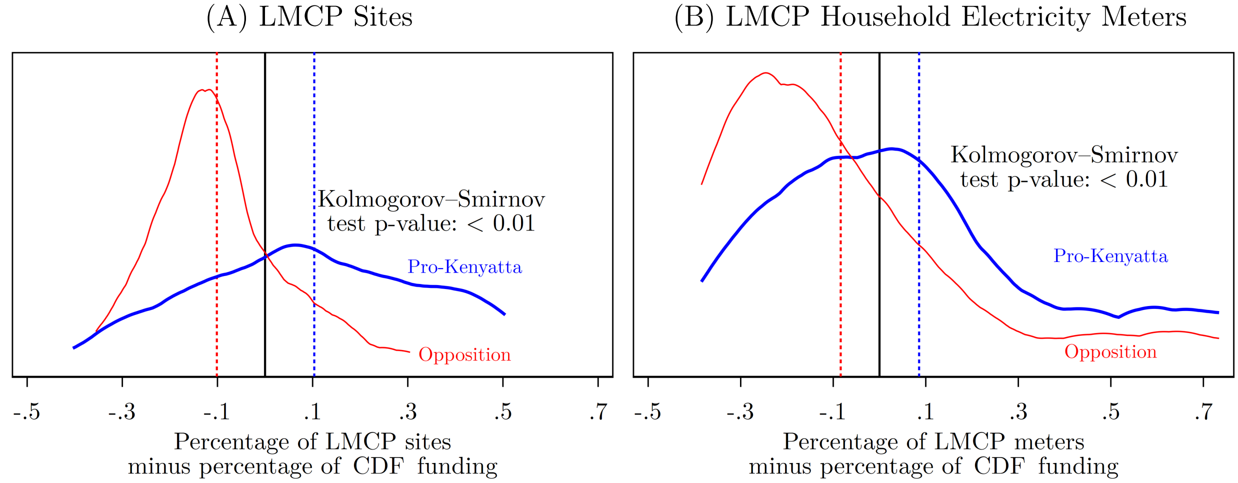
Columns 4, 5, and 6 of Table 1 measure the gap in electricity meters between constituencies that voted pro-Kenyatta in 2013 and constituencies that voted for the opposition, relative to the share of public funds each constituency was allocated per the CDF formula (that is, the number of household electricity meters per 100,000 households minus the hypothetical number had meters been allocated according to the CDF formula). Since constituency allocations are (by definition) only available at the constituency level, these estimates have fewer observations and the coefficient estimates are less precise. Still, Column 4 shows that constituencies that voted pro-Kenyatta in 2013 had over 5,500 more household electricity meters per 100,000 households relative to their CDF allocation than constituencies that voted for the opposition—a 35% gap compared to the opposition mean of around 16,000 meters per 100,000 households. This coefficient is again stable after introducing the same set of socio-economic controls as for the wards (Column 5) and LASSO-selected quadratic and cubic transformations and triple-interactions of these controls (Column 6). Taken together, these results show that the allocation of electrification deviated meaningfully from its publicly stated benchmark, in favor of pro-Kenyatta areas.

To examine whether this effect is driven by outliers or persists across the distribution, we define each constituency's 'allocation deviation' as the share of LMCP sites a constituency was awarded minus its share of CDF funding. Had sites been allocated exactly according to the CDF formula, allocation deviations would be concentrated at zero; positive values mean that the constituency was allocated more LMCP sites or meters than its CDF share.

Figure 3 compares the distributions of allocation deviations between constituencies that voted pro-Kenyatta (blue) and opposition (red) in the 2013 presidential election. Panel A shows that pro-Kenyatta constituencies were disproportionately allocated more LMCP sites—on average, 110% of the allocation they would have received under the CDF rule—while constituencies that voted for the opposition received on average only 90% of their allocation. Similarly, panel B shows that pro-Kenyatta constituencies saw significantly more active household electricity meters than opposition constituencies, relative to their CDF allocations. For both outcomes, t-tests under the null that the means are equal and Kolmogorov-Smirnov tests under the null that the distributions are equal are rejected with p-value < 0.01. Plotting the residuals after controlling for socio-economic characteristics shows a slightly narrower distribution but an almost identical difference (Figure A13). The results persist when using all wards nationwide instead of just LMCP wards (Figure A14) and when comparing allocations to population or to land area (Figure D4).

Columns 4, 5, and 6 of Table 1 and Figure 3 provide evidence that the government selected significantly more LMCP sites and activated significantly more household electricity meters in pro-Kenyatta wards relative to the CDF formula. Taken together, these results indicate that there was substantial pro-Kenyatta favoritism in the allocation of household electrification in Kenya, on the order of 20% to 35%.

Figure 3: Constituency LMCP shares relative to Constituency Development Fund (CDF) shares by 2013 election result



A constituency's share of nationwide LMCP outcomes minus its share of Constituency Development Fund (CDF) funding, by whether constituencies voted pro-Kenyatta in the 2013 presidential election, bottom- (top-) coded at the 5th (95th) percentile. Panel A shows LMCP sites selected. Panel B shows LMCP household meters activated. Vertical lines indicate sample means. Shares are normalized according to the same sample as in Table 1. These patterns hold when plotting residuals after controlling for the same socio-economic controls as Column 2 of Table 1 (Figure A13). Figure D5 presents a scatter plot version.

While these levels of favoritism are economically and statistically meaningful, the estimates are significantly lower than those pertaining to favoritism between the 1970s through the early 2000s identified in Burgess et al. (2015) and Barkan and Chege (1989) (Figure A15). This points to an encouraging continuing downward trend over time in the magnitude of political favoritism, coinciding with major reforms that have strengthened democratic institutions and decentralized government functions.

4.3 Targeting core versus swing supporters

Political favoritism can operate through different approaches to electoral targeting. In 'swing' electoral areas, where the margins between political parties are relatively small, parties may allocate public investment in the belief that they can sway which party voters will support. In 'core' electoral areas, where a clear majority of voters supports one party, the objective may be to drum up electoral turn-out among committed partisans or to reward them for past support.

Was political favoritism in electrification targeted towards core or swing areas? We define swing regions to be wards where one party won 50–75% of the vote in the 2013 presidential elections, and core support regions as wards where a party won between 75–100% of the vote.[13] The following equation estimates how electrification allocations differ between these areas, such that coefficient

[13] Even with this generous definition swing areas are relatively scarce in this polarized political environment, comprising only 14% of wards in the analysis sample (23% nationally).

Table 2: Electricity meters per 100,000 households in core and swing regions

	In absolute terms		
	(1)	(2)	(3)
Pro-Government Core (δ_1)	3609***	4013***	4543***
	(1098)	(1235)	(928)
Pro-Government Swing (δ_2)	4315**	2845	2928*
	(1963)	(2272)	(1613)
Pro-Opposition Swing (δ_3)	2686*	2889**	2538**
	(1530)	(1401)	(1258)
Observations	911	911	911
Pro-Opposition Core Mean	14095	14095	14095
p-val $\delta_1 = \delta_2 = \delta_3$	.73	.74	.28
p-val $\delta_1 = \delta_2$	.72	.62	.34
Controls	None	SES	LASSO
Sample	Wards	Wards	Wards

Results from Equation 3. Samples and specifications are identical to those presented in Columns 1–3 of Table 1. Pro-Kenyatta Core are wards where the government received >75% of the presidential vote in the 2013 elections (414 wards). Pro-Kenyatta Swing: government received 50–75% (44 wards). Pro-Opposition Swing: opposition received 50–75% (81 wards). Omitted: Pro-Opposition Core (372 wards). SE clustered by constituency in parentheses. $^{*} \leq 0.10, ^{**} \leq .05, ^{***} \leq .01$.

estimates are relative to core opposition wards:

$$y_i \quad = \quad \delta_0 + \delta_1 ProGov_i \times Core_i + \delta_2 ProGov_i \times Swing_i + \delta_3 Opp_i \times Swing_i + \boldsymbol{\gamma}\mathbf{X_i} + \varepsilon_i \qquad (3)$$

Table 2 indicates that pro-Kenyatta core areas received the largest number of electrification connections, at 32%. That said, pro-Kenyatta swing areas and opposition swing areas also see higher levels of household electrification than core opposition areas, on the order of 18%–21% higher, and we cannot reject that the three areas all benefited from similar levels of electrification. Results are qualitatively robust to defining 'core' as having >60% or >80% of the presidential vote (Table D2, Table D3). The pattern also broadly persists when comparing against the CDF benchmark formula, although the estimates are noisier because the sample sizes become smaller when running regressions by constituency instead of by ward (Columns 4–6 of Table D1, Table D2 and Table D3).

5 National and subnational favoritism

What is the role of decentralization in the pro-Kenyatta favoritism identified in the previous section? The findings presented above are consistent with two broad hypotheses. One possibility is that decentralization successfully empowered local officials but these actors continued to enable or enact pro-Kenyatta favoritism. Another possibility is that decentralization did not empower local politicians sufficiently for them to be able to alter the centrally preferred allocation, and that power and resources remained concentrated *de facto* with national leaders.

We evaluate the roles of national and sub-national officials in two ways. First, we evaluate marginal favoritism across the four stages of rural electrification, which were implemented by different levels of government. Second, we assess how members of parliament shaped implementation.

5.1 Favoritism across the four stages of electrification

As discussed in Subsection 2.3, rural electrification consisted of four stages. Understanding how political favoritism differed across these stages can shed light on the underlying mechanisms.

Crucially, national-level authorities had tight control over the first two stages of rural electrification: transformer installation and the selection of LMCP sites. These activities were implemented by Kenya Power and the Rural Electrification Authority, which are both parastatals controlled by the national government. As a result, these stages may have been more subject to political pressure by the central executive.

Conversely, local officials one or more steps removed from the president's administration were responsible for implementing the final two stages: local network construction and meter activation. Local network construction was implemented by private contractors, each of which was responsible for LMCP sites in a specific set of counties (Wolfram et al., 2023). After contracts had been awarded and administered, contractors interacted primarily with regional Kenya Power offices located in their geographic area of responsibility for the duration of the implementation period. Meter activation was completed by local Kenya Power offices. As a result, these latter stages may have been less easily influenced by the central government, and subject to stronger influence by local politicians.

To examine where aggregate favoritism originated, we decompose the cumulative effect into the marginal impacts during each stage, conditional on attaining the previous stage. Table 3 presents the results. Column 1 indicates a 17% pro-Kenyatta bias in the placement of transformers between 2008-2016, prior to the start of the LMCP. Column 2 indicates that the selection of LMCP sites from among the set of transformers further exacerbated this difference by 21%, for a cumulative difference of 42% in the number of LMCP sites. The bulk of cumulative favoritism thus is driven by these first two stages. Columns 4 and 6 show little evidence of additional favoritism in local network construction and the activation of household meters, with the marginal impacts if anything attenuating the overall difference slightly. Still, the favoritism exerted in the initial stages leads to significant favoritism in all stages of the program. The order of magnitude of favoritism is robust to a wide range of specifications.[14] Estimating the effects in columns 1, 3, 5, and 7 relative to the Constituency Development Fund (CDF) formula shows quantitatively and qualitatively similar (and if anything slightly larger) effects, with similar patterns of statistical significance (Table D10).[15]

Taken together, aggregate political favoritism in Kenyan electrification at the household level

[14] Specifically, results are qualitatively similar when dropping socio-economic controls (Table D4), using LASSO to select socio-economic controls (Table D5), not weighting by population (Table D6), only comparing adjacent wards (Table D7), and using per capita rather than per household (Table D8). Adding constituency fixed effects dampens the effects, indicating the results are driven by across-constituency rather than within-constituency targeting (Table D9). This makes sense since political affiliation correlates strongly across wards in the same constituency.

[15] We focus on the ward-level regressions, rather than the constituency-level regressions relative to the CDF formula because—for the marginal effects—it is mathematically nonsensical to estimate favoritism relative to both the CDF and the previous stage simultaneously.

Table 3: Cumulative and marginal favoritism across the stages of electrification

	Pre-existing Transformers	LMCP					
		Site Selection		Construction		Meters	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Voted pro-govt in 2013	108***	.0539***	62.6***	-.0428	27.1***	-5.34	3092***
	(41.3)	(.0178)	(11.2)	(.0415)	(10.2)	(11.1)	(1159)
Observations	911	910	911	587	587	882	911
Opposition Mean	644.3	0.3	148.7	0.5	83.1	125.1	14443.6
Treatment Effect (%)	16.8	21.2	42.1	-8.0	32.6	-4.3	21.4
Analysis		Marg.	Cumul.	Marg.	Cumul.	Marg.	Cumul.

All regressions at the ward level, weighted by ward population, with same socioeconomic controls as in Table 1 and standard errors clustered by constituency. For Column 1, y_i is number of transformers per 100,000 households. For Columns 2, 4, and 6, the regressions isolate the marginal impact of that particular stage. In Column 2, y_i is proportion of transformers selected for LMCP; in Column 4, y_i is LMCP sites completed per LMCP transformer; in Column 6, y_i is LMCP meters per LMCP transformer. For Columns 3, 5, and 7, the regressions are cumulative across stages of construction. In Column 3, y_i is LMCP transformers; in Column 5, y_i is LMCP sites completed; in Column 7, y_i is LMCP meters; all per 100,000 households. Results persist across a range of sample and regression specifications (Table D4 through Table D8). Table D9 adds constituency fixed effects. $^{*} \leq 0.10, ^{**} \leq .05, ^{***} \leq .01$.

appears entirely driven by stages that were largely controlled by the central government, namely, the initial stock of pre-LMCP transformers and LMCP site selection. There appears to be no statistically significant favoritism in the latter stages of construction, which were managed locally.

5.2 Members of Parliament

Each of Kenya's 290 constituencies is represented in the legislature by an elected member of parliament (MPs). Volkert and Klagge (2022) observe that, based on interviews conducted in February 2020, Kenya Power and REA officials often expressed a preference for working with local MPs over county governments.[16] MPs furthermore have some control over local public spending: Harris and Posner (2019) and Opalo (2022a) both note how MPs largely determine how CDF funds are used within their constituencies. Although MPs are technically national-level officials and spend much of the year in Nairobi, many interviewees stated that MPs are seen as "representative[s] of the people." MPs are one of the few locally elected offices that predate Kenya's recent devolution reforms, and unlike other local officials (e.g., senators or members of the county assembly), MPs often have close formal and informal links to Kenya Power and REA. As discussed in Subsection 2.3, Kenya Power and each constituency's MP jointly selected the locations of transformers within each constituency, giving MPs the ability to directly exert influence on the process.

MP favoritism may have taken at least two forms. While neither can fully account for the aggregate levels of favoritism we observe, these are the most likely channels through which local politicians could have exerted political influence. First, MPs may have exerted bias when allocating LMCP sites to specific wards within their constituencies to favor those wards that had voted for

[16]The 2019 Energy Act created the Rural Electrification and Energy Corporation (REREC) as a successor of REA.

Table 4: Effects of MP alignment on stage outcomes (with constituency fixed effects)

	Pre-existing Transformers	LMCP					
		Site Selection		Construction		Meters	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Voted pro-govt in 2013	143	-.022	13.5	-.0908	-17.5	-17.8	1205
	(111)	(.0376)	(26.6)	(.0633)	(17)	(27.6)	(1700)
Voted pro-MP in 2013	-42.3	.0237*	1.43	.00613	.49	-6.39	-150
	(31.3)	(.0142)	(8.78)	(.0326)	(8.63)	(10.2)	(777)
Observations	731	730	731	478	478	706	731
Opposition Mean	644.3	0.3	148.7	0.5	83.1	125.1	14443.6
Treatment Effect (%)	22.2	-8.7	9.0	-16.9	-21.1	-14.2	8.3
MP Effect (%)	-6.6	9.3	1.0	1.1	0.6	-5.1	-1.0
Analysis		Marg.	Cumul.	Marg.	Cumul.	Marg.	Cumul.

All regressions are at the ward level, weighted by ward population. Socioeconomic controls are as in Table 1, with the addition of constituency fixed effects. 'Voted pro-MP in 2013'=1 if the ward voted for the winning MP in the 2013 constituency-level National Assembly elections. For column 1, y_i is number of transformers per 100,000 households. Columns 2, 4, and 6 isolate the marginal impact of each stage. In column 2, y_i is proportion of transformers selected for LMCP; in column 4, y_i is LMCP sites completed per LMCP transformer; in column 6, y_i is LMCP meters per LMCP transformer. Columns 3, 5, and 7, estimate cumulative effects across stages. In column 3, y_i is LMCP transformers; in column 5, y_i is LMCP sites completed; in column 7, y_i is LMCP meters; all per 100,000 households. SE clustered by constituency are in parentheses.

them in constituency elections. Kenya Power and REA employees interviewed by Volkert and Klagge (2022) reported that MPs decisions about where to implement REA projects were "influenced by political intentions, especially the desire for re-election". While these would not contribute to the cross-constituency results we estimate in Columns 4, 5, and 6 of Table 1, they could have contributed partly to the ward-level regression results in Table 3 and in Columns 1, 2, and 3 of Table 1. Second, across constituencies, MPs aligned with the pro-Kenyatta ruling party at the national level may have been able to channel more resources to their constituencies relative to MPs aligned with the opposition coalition. The next two sections evaluate these two hypotheses in turn.

5.2.1 Within-constituency favoritism

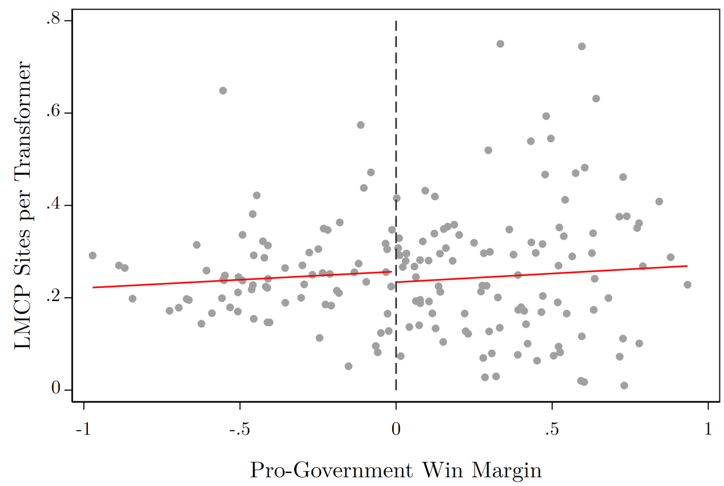
Do MPs favor the wards in their constituencies that voted for them with more LMCP projects? For wards indexed by i, Table 4 presents estimates from the following equation, with the new MP coefficient (θ_2) in the second row:

$$y_{ic} \quad = \quad \theta_0 + \theta_1 ProGovernment_{ic} + \theta_2 ProMP_{ic} + \gamma X_{ic} + \gamma_c + \varepsilon_i \tag{4}$$

where $ProGovernment_i$ equals 1 if ward i voted pro-Kenyatta in the 2013 presidential elections (paralleling the analysis above) and $ProMP_i$ equals 1 if the MP candidate with the most votes in ward i also won the overall constituency election. γ_c is a constituency fixed effect.

Three of the four stages show no evidence that a ward having voted for the overall winning MP affects that ward's electrification outcomes. Column 2 shows marginally significant pro-MP

Figure 4: Share of constituency's transformers selected for LMCP



The running variable—pro-government win margin—represents the difference between the vote share of the best performing pro-Kenyatta coalition (Jubilee) candidate and the best-performing candidate not in the pro-Kenyatta coalition in the 2013 parliamentary elections. Linear trends on either side of the 0-margin line are weighted by constituency population. A sharp discontinuity test yields a coefficient of 0.03 which fails to reject (*s.e.*=0.04). The results are qualitatively the same for construction outcomes (Figure A16).

favoritism in the selection of LMCP sites within a constituency, a pattern in line with Kenya Power and the MPs being jointly responsible for site selection (as discussed in Subsection 2.3). Still, the point estimate is considerably smaller than the presidential vote effect, and there is little evidence that areas that voted for their MP were favored in the final program outcome, the activation of household electricity meters (columns 6 and 7). Taken together, these results indicate that the main results presented above are not driven by MPs rewarding wards that voted for them in the 2013 election with more electrification projects (the estimates are slightly noisier due to the inclusion of constituency fixed effects). Results are similar in specifications that drop socioeconomic controls (Table D12), select controls using a LASSO procedure (Table D13), drop population weights (Table D14), use the adjacent wards sample (Table D15), use per-capita as opposed to per-household outcome measures (Table D16), or dropping constituency fixed effects (Table D17).

5.2.2 Across-constituency favoritism

Was there increased electrification in constituencies that elected an MP politically aligned with Kenya's President? To evaluate this, Figure 4 presents a close election regression discontinuity design. The running variable is the gap in vote share between the best-performing pro-Kenyatta coalition candidate and the best-performing non-coalition candidate in the 2013 MP elections. Win margins in this context have a relatively smooth distribution, with little evidence of bunching and a notable mass of electoral outcomes near zero (Figure D6).

Figure 4 does not show a meaningful discontinuity at zero, indicating that electing an MP who was aligned with the central government did not meaningfully increase a constituency's share of transformers selected for LMCP. A robust regression discontinuity in the style of Calonico, Cattaneo, and Titiunik (2014) with linear trends fails to reject the null of no discontinuity with a p-value of 0.44. This departs from existing research on local politicians in the U.S. (Alesina, Baqir, and Easterly, 1999; Ferejohn, 1974), but is in line with Harris and Posner (2019) who study MPs in Kenya (Figure A15). Using the same regression discontinuity strategy with each of the four stages as the outcome similarly shows no effects (Figure A16).

It is worth noting that, by design, discontinuity estimates are identified off of constituencies where the electoral result was near the margin. MP races saw more close wins than would be suggested by presidential voting results, partly due to the presence of candidates from multiple competing parties. 32% of constituencies saw a win margin of less than 20 percentage points. MP alignment could increase a constituency's share of LMCP sites in core pro-government areas far from the discontinuity, which could contribute to the results presented in Section 4. However, given substantial correlation between MP and presidential voting patterns, we are unable to readily disentangle these alternatives.

6 Surplus estimation: Intuition and empirical approach

The previous sections presented evidence that the allocation of rural electrification projects favored pro-government constituencies relative to the Constituency Development Fund formula. How did this deviation affect economic surplus? This section presents a simple framework that guides the empirical exercise and then describes the empirical approach. Section 7 presents the results.

6.1 Theoretical intuition

Many public investments—such as broadband, airports, and electricity connections—do not generate utility directly. Rather, they enable agents to consume goods that generate utility—such as internet, travel, and lighting. These types of public investment often generate larger surplus gains to higher-income agents, for whom the infrastructure enables higher levels of consumption. This pattern of regressive surplus gain has been documented across a host of public investments.[17]

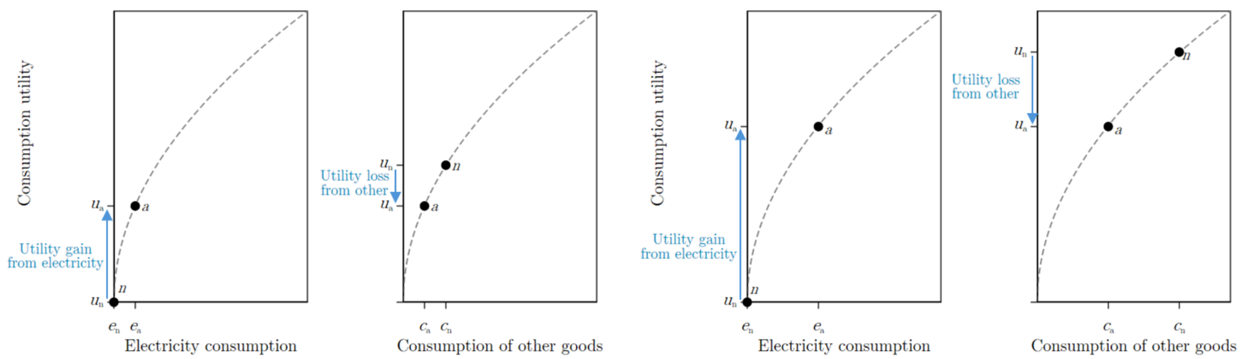
In the context of electricity connections, Lee, Miguel, and Wolfram (2020a) document that low-income households may not be able to afford much more than a lightbulb and a phone charger, two appliances that many Kenyans already owned anyway, and that they charge using solar power (for instance, 50% of Kenyans own a solar light). High-income households, on the other hand, more often purchase larger appliances such as televisions, refrigerators, irons, and fans, or start income-generating businesses. The model and empirics are agnostic as to whether income heterogeneity reflects differences in income or differences in attributes correlated with income, such as access to credit, education, and market access.

Figure 5 illustrates with a simple example how the increased surplus from electricity access can vary by income. Consider an agent endowed with either high or low income such that $Y_L < Y_H$.

[17] See for example Glaeser (2008), Gaubert et al. (2025), Benabou (2000), Guerreiro, Rebelo, and Teles (2021), Herwartz and Theilen (2017), Haushofer et al. (2025), and Daruich and Fernández (2024).

Figure 5: Utility gains from connecting low-income and high-income agents

(A) Low-income agent (B) High-income agent



Note: With no electricity access (n), the agent consumes no electricity ($e_n = 0$) and spends all their money on other goods ($c_n = Y$). With electricity access (a), the agent consumes electricity and other goods to the point where their marginal utilities equal. By the curvature of the utility curve, utility with access exceeds utility without access, by an amount that increases with income.

The agent can consume two goods, electricity e and outside consumption c. With no access to electricity, the agent spends all their income on the other good, such that $e_n = 0$ and $c_n = Y_i$. Utility is additively separable, so when the planner provides the agent with electricity access, the agent equalizes the marginal utilities of both goods. The net utility gain is $U = u_e(e_a) + u_c(c_a) - u_c(c_n)$, which by the curvature of the utility function is greater for high income agents than for low income agents (proof in Appendix C).

For simplicity, and since LMCP households were connected without an upfront fee, we assume that acquiring an electricity connection does not affect income (which is also consistent with the findings in Lee, Miguel, and Wolfram, 2020b). Rather, this exercise can be thought of as asking how much additional surplus is generated when the price per unit of electricity falls from a high level (that leads to zero consumption) down to the observed price. Acquiring a free electricity connection can be thought of as equivalent to such a price drop.

6.2 Estimation and simulation

Identifying the set of ex ante unconnected households requires first estimating the joint distribution of income and electricity access within each constituency and (conditional on being connected) the relationship between income and electricity consumption among rural households within each constituency (Figure A17). As described in Subsection 3.3, these exercises primarily use micro-data collected by the Kenyan National Bureau of Statistics. Since the KNBS does not collect income per se, and since aggregate household consumption is widely thought to be a higher-quality and more stable measure of household well-being, we use consumption as a proxy for income and our primary measure of socioeconomic well-being.[18] The conversion of electricity spending (in kSh) to

[18]Income data are often systematically under-reported, and are also more time-varying than consumption which tends to be smoothed, and thus less accurately capture a household's long-term economic well-being. See Deaton

electricity consumption (in kWh) uses an average electricity price of USD 0.18 per kWh, recovered from observed electricity purchasing data (Berkouwer et al., 2023).[19]

Finally, we apply a price elasticity of electricity consumption of $\epsilon_D = -0.3$, 10% annual electricity spending growth, and assume a linear approximation for the electricity demand function to calculate the consumer surplus derived from electricity consumption (similar to Lee, Miguel, and Wolfram, 2020b; Mahadevan, 2024; Burlig and Preonas, 2024). We assume that not having an electricity connection generates zero additional surplus and that an electricity connection only generates surplus through the consumption of electricity. Aggregate surplus is defined as the net present value of 30 years of consumption, discounted at 15% per year. These assumptions yield an estimated 22.5 USD in aggregate consumer surplus per 1 kWh consumed monthly over the lifetime of the connection. The qualitative results are robust to alternative assumptions of demand elasticity and electricity spending growth (Figure A18, Figure A19, Table B6).

Surplus gains under this approach approximate the compensating variation required to make a household indifferent between having an electricity connection versus no electricity connection plus cash. In the absence of income effects in electricity consumption, Hicksian and Marshallian demand for electricity would coincide, and surplus gains under this approach would exactly reflect the compensating variation (Mas-Colell, Whinston, and Green, 1995).

Using these estimates, we simulate gains in aggregate surplus under four scenarios, each of which allocates electricity connections to exactly 840,548 households (the observed number of LMCP meters): the observed allocation, the Constituency Development Fund (CDF) allocation, a politically neutral surplus-maximizing allocation, and an unconstrained surplus-maximizing allocation. Under all four scenarios, we assume that a household's probability of already being connected before the LMCP is consistent with observed pre-LMCP connection rates by income for each constituency (though as stated above, the results are robust to alternative assumptions).

When allocating LMCP meters across constituencies, the observed and CDF allocations mirror those used for Table 1. Within each constituency, both of these scenarios assume that the propensity of an unconnected household to be connected through the LMCP is random, following the LMCP's stated goal of connecting 'all Kenyans' to electricity without regard to socioeconomic status. We apply realizations at the household level by constituency vote share, assuming pro-Kenyatta and opposition voters have identical income distributions within each constituency.[20,21] The two surplus-maximization scenarios sidestep constituency boundaries and assign connections to households who

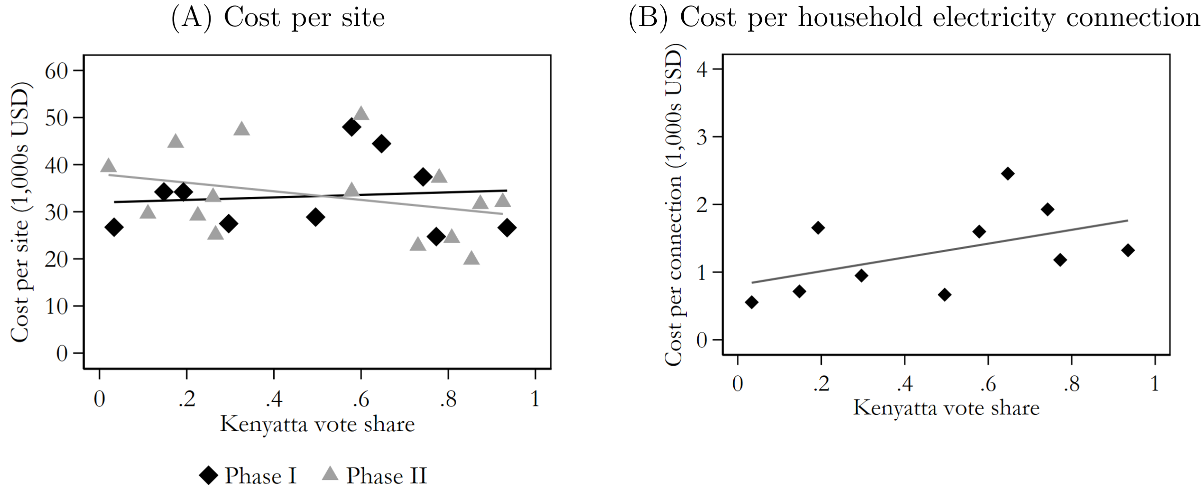
(1997), Browning, Crossley, and Winter (2014), and Carletto, Tiberti, and Zezza (2021) for more rigorous treatments of these measurement concerns, and Silber (2023) for a recent research methods handbook.

[19] The composition and levels of Kenyan electricity tariffs vary frequently over this time period; using the observed receipts data is thus more reliable than attempting to recover price data directly.

[20] The results are qualitatively unchanged when estimating results at the constituency level, mirroring Section 4, rather than allocating surplus proportionally to each constituency's vote share (Panel B of Figure A19).

[21] While household-level data almost never contains political voting data, at the ward level there is a weak and noisy correlation between income and political affiliation. Among unconnected households within a constituency, an increase in Kenyatta voteshare from 25% to 75% is associated with just a 1.5% decrease in annual household consumption (Figure D10). If anything this assumption would therefore seem to bias the approach against finding evidence of political favoritism impacting welfare.

Figure 6: Cost estimates across 25 construction contracts



Note: At most LMCP sites that saw at least some construction, Kenya Power connected between 10-100 households. Household-level connection costs are only available for Phase I. In panel A, the 95% confidence intervals for the slope coefficients are [-19, 29] and [-24, 8]. In panel B, the 95% confidence interval is [-0.7, 2.6].

were ex ante unconnected but are expected to generate the largest surplus gains from connection; given the model set-up, in practice these are simply the highest-income households.

6.3 Cost

Estimating aggregate surplus requires estimating both consumer surplus and supplier costs. Even if consumer surplus does not vary with political affiliation, political favoritism might still be justifiable if construction costs were systematically lower in pro-government areas than in opposition ones. For example, if opposition areas are hillier than pro-government areas, increasing construction costs, then favoring pro-government regions might have increased total surplus.

To evaluate this, we use cost data from the 25 contracts signed between Kenya Power and construction firms. As discussed in Subsection 2.3, construction for the LMCP was conducted entirely by private sector contractors. Firms were awarded contracts to connect all unconnected households at a set of designated LMCP sites in a geographic cluster of two to six counties. Most contracts were "turn-key", covering all aspects of construction, from the creation of electrical designs to expand the local grid, to the procurement of materials, to the actual on-the-ground construction (Wolfram et al., 2023). Ten turn-key phase I contracts were signed in 2015 and fifteen phase II were signed in 2017. Helpfully, contracts' geographic clusters largely followed political boundaries, allowing us to compare costs across political regions.

We define cost per site as the contract's total cost divided by the total number of LMCP sites across the counties specified in the contract. Panel A of Figure 6 compares cost per site with the aggregate pro-Kenyatta vote share for the corresponding geographical region, for all 25 construction contracts. Panel B complements these data with meter count data to calculate the average cost per household electricity connection.[22] It is reassuring that the estimated cost per household matches previous estimates in the same context (Lee, Miguel, and Wolfram, 2020b).

Political affiliation and construction costs per site are not meaningfully correlated (Panel A). There is also no strong correlation between political affiliation and cost per connection (Panel B). Pro-Kenyatta regions face slightly higher costs per connection, but the slope is not statistically different than zero, and if anything this would justify a bias *against* pro-Kenyatta wards. Given the fact that construction costs tend to decline with the number of connections, this cannot be explained by the larger number of connections in pro-Kenyatta regions. LMCP sites in wards that voted for Kenyatta also exhibit similar distances to major towns, land gradient, and nighttime radiance compared to pro-opposition areas, suggesting that there are no meaningful underlying characteristics that might cause substantial differences in construction cost (Figure A20). If anything, pro-Kenyatta wards appear slightly hillier than opposition wards, which would again imply a *higher* cost per connection.

These results are somewhat imprecisely estimated, so we refrain from incorporating cost estimates into the surplus calculations. Still, the lack of a clear correlation suggests that any cost differences correlated with political affiliation are not a major determinant of aggregate surplus.

7 Surplus estimation: Results

Table 5 presents estimates of consumer surplus, political favoritism, and regressivity under the four scenarios laid out above: the Constituency Development Fund (CDF) allocation, the observed allocation, a politically neutral surplus maximization, and an unconstrained surplus maximization.

Aggregate surplus is estimated to be 2.3% *higher* under the observed allocation than under the CDF allocation (745 versus 728 million USD). In other words, the observed allocation generated more aggregate surplus than the stated benchmark allocation. Thus political favoritism does not necessarily always lower welfare; in some contexts (including this one) favoritism can increase total economic surplus.

It is worth noting that there is significant uncertainty around how much total economic surplus the program will generate. For example, under the observed scenario, assuming a demand elasticity of -0.3, the LMCP's 343 million USD investment generated either a -3% or 117% aggregate return depending on whether over the next 30 years rural household electricity demand stays constant or grows by 10% per year (Table B6). This reflects real uncertainty in these growth trajectories.

These modest surplus gains must be understood in light of three additional considerations: efficiency, favoritism, and equity, which are discussed in the next three sections.[23]

[22] The data only identify meter counts for Phase I sites.

[23] Importantly, the qualitative results around political favoritism and equity are consistent across a wide range of modeling assumptions (Figure A18, Figure A19).

Table 5: Consumer surplus, political favoritism, and regressivity across four allocations

	Total consumer surplus (mn USD)	Political favoritism (%)	Regressivity (ratio)
Announced policy allocation	728.12	-0.1	1.0
Observed allocation	744.89	4.5	1.2
Surplus maximizing allocation—politically neutral	1041.31	0.0	5.0
Surplus maximizing allocation	1041.32	0.3	5.0

Note: Political favoritism represents the percentage point difference between previously unconnected pro-Kenyatta and opposition households who received connection through LMCP. Regressivity is the fraction of previously unconnected households that receive connection through LMCP that are in the highest income quintile of unconnected households, divided by 20%, which would be the equitable allocation. The announced policy was to allocate connections according to the Constituency Development Fund formula. The third row maximizes surplus subject to the constraint that equal fractions of unconnected pro-government and opposition voters get connected. Figure A21 presents these dimensions visually. Table B6 shows additional outcomes and assumptions.

7.1 Efficiency

Political favoritism might be justifiable on the basis of surplus maximization if, for example, the average surplus generated per connection was higher among pro-Kenyatta voters than among opposition voters. However, there is no evidence of this. Panel A of Figure 7 plots the average consumer surplus per connection among pro-Kenyatta and opposition voters separately. If anything, the average gain in surplus per connection is slightly higher among opposition voters. Panel B shows that the difference in aggregate surplus is driven entirely by the difference in the fraction of unconnected households who were connected under the LMCP.

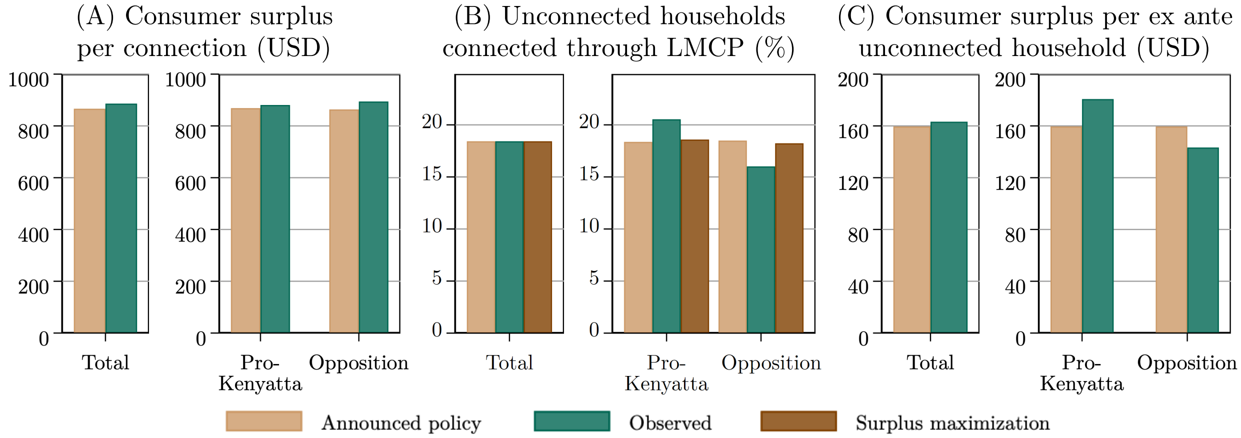
The unconstrained surplus-maximizing allocation also shown in panel B furthermore shows no favoritism. Pro-Kenyatta areas see more connections when compared with both the CDF allocation and with an unconstrained surplus-maximizing benchmark. The observed allocation's political bias therefore can not be motivated by surplus maximization alone.

Finally, even constraining the possible set of allocations to those that are politically neutral yields a surplus gain that is 99.99% as large as what can be achieved under the unconstrained surplus-maximizing allocation. This suggests that enforcing political neutrality in allocation of grid connection in this context would not meaningfully lower total economic surplus.

7.2 Political favoritism

Panel C of Figure 7 plots aggregate consumer surplus per ex ante unconnected household, which captures both the fraction of households connected and the surplus gain per connection. The left side shows that the observed allocation led to on average 2.3% higher consumer surplus among households who were unconnected at baseline. However, this increase in surplus comes at the expense of opposition voters. It is not just that the 2.3% increase in surplus was captured entirely by pro-Kenyatta voters. The right side in panel C of Figure 7 indicates that consumer surplus for opposition voters was 10% *lower* under the observed outcome than under the CDF allocation, while among

Figure 7: Political favoritism and allocative efficiency



Note: Within each constituency, connections are randomly allocated to households, following LMCP practices. The announced policy was to allocate connections according to the Constituency Development Fund (CDF). Panel A shows that there was no significant difference in consumer surplus per connection, which might have warranted targeting that correlated with political affiliation. Panel B shows that the observed allocation favored pro-Kenyatta voters relative to both the CDF allocation as well as to the surplus-maximizing allocation, suggesting political bias in this context cannot be justified on the basis of surplus maximization. Panel C shows that consumer surplus per ex ante unconnected household in USD under the observed allocation and a counterfactual allocation that follows the CDF formula.

pro-government voters it was 13% higher. Under a range of assumptions, the observed distribution exhibits a 18.3% to 26.5% bias towards pro-Kenyatta households (Figure A18, Figure A19).[24] For comparison, estimates of favoritism under the CDF allocation range from just −5.2% to 0.8%.

7.3 Equity

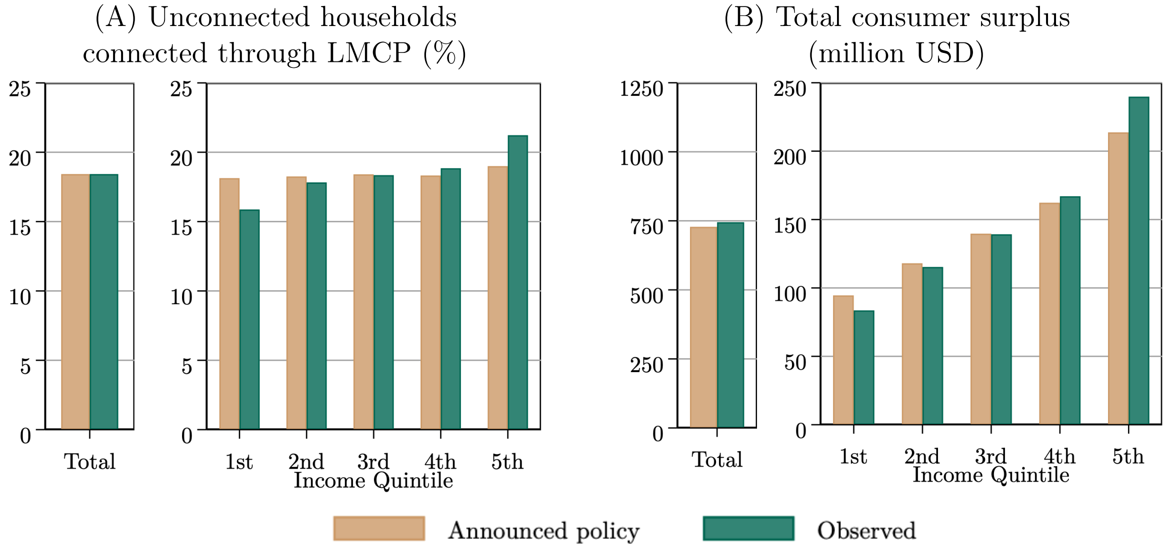
As discussed in Subsection 2.4, the government's goal in connecting low-income Kenyans was to promote human development, rather than simply maximizing aggregate surplus. This goal can be justified from a welfare perspective if the social planner has a welfare function that places higher weight on lower-income individuals, or if lower-income individuals face market frictions such as credit constraints, and/or if the planner faces a constraint on transfers to enact its preferred income distribution.

Panel A of Figure 8 shows that the CDF rule would have assigned largely similar connection probabilities to all unconnected households, regardless of income. Instead, the observed allocation assigned 37% more connections to households in the highest-income quintile of unconnected households than to the lowest-income quintile.MW: I am seeing this as 34 percent see realPercentMoreConn in 8.d0. Maybe I am misunderstanding, how is this different from the 1.3 times more connections below?

This increased surplus because connecting a higher-income household generates a larger surplus gain than connecting a lower-income household. However, it decreased surplus for the poor, who received 12% less surplus under the observed allocation than what they would have received under

[24] We define favoritism as the surplus per pro-Kenyatta household minus the surplus per opposition household, divided by the surplus per opposition household.

Figure 8: Connections and consumer surplus by income quintile



Note: Within each constituency, new connections are randomly allocated to households, following LMCP practices. The announced policy was to allocate connections according to the Constituency Development Fund (CDF). Panel A shows that the CDF allocation would have allocated approximately equal numbers of connections to all households regardless of income quintile, but that the observed allocation favored higher income households over lower-income households. Panel B shows total consumer surplus, which favors higher-income households relative to panel A because connecting a higher-income household generates more surplus than connecting a lower-income household.

the CDF allocation. The observed deviation thus undermined the stated goals of the CDF, and of the LMCP.

Regressivity in the number of connections is exacerbated by the fact that lower-income households gain less surplus from being connected. The CDF formula would have allocated equal numbers of connections across all income quintiles of unconnected households, but would have generated 2.3 times more surplus for the highest than for the lowest quintile. The observed allocation generated 1.3 times more connections and 2.9 times more surplus for the highest quintile, as shown in panel B of Figure 8. This is not driven by political affiliation in our setting, and these patterns are similar across pro-Kenyatta and opposition voters (Figure A22).

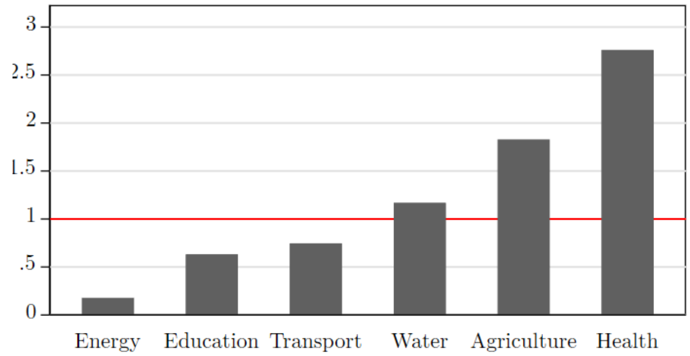
8 Policy discussion

Subsection 8.1 discusses why Kenya's decentralization reforms did not completely eliminate favoritism, while Subsection 8.2 discusses the role of other sources of accountability in lowering political favoritism. Subsection 8.3 discusses implications for the global energy transition.

8.1 The limitations of decentralization in the electricity sector

How was favoritism able to persist despite significant constitutional decentralization reforms, which helped Kenya become one of Africa's most democratic societies (Figure A1)? Dozens of countries have enacted political and fiscal decentralization in recent decades, including India, Indonesia,

Figure 9: Decentralization across sectors



Note: The ratio of the share of subnational spending on a sector to the share of national spending on that sector (Kenya Treasury, 2022; Kenya Office of the Controller of Budget, 2022). Figure A23 plots county-level data.

Mexico, China, and Nigeria, with heterogeneous implementations and results across countries and sectors.[25] Benefits to decentralization have been found in service sectors and sectors that benefit from local adaptation, including to demographic, religious, linguistic, or topographic diversity, such as health, agriculture, sanitation, and education.[26] Decentralization may be less effective in sectors with complex networks, cross-unit externalities, economies of scale, and high demand for technical skills (what Prud'homme (1995) calls 'technicity'), such as environmental regulation, anti-trust, national security, transportation networks, telecommunications, and energy, and this is obviously the relevant case in our study setting.[27]

In Kenya's energy sector, only 1.1% of total public spending is disbursed by county governments, with 98.9% by the Ministry of Energy.[28] For comparison, 45% of total public health expenditures is spent by county governments (versus 55% by the national health ministry). To compare decentralization across sectors, define the degree of decentralization δ_s in each sector s to be the ratio of the share of subnational spending spent on sector s to the share of national spending spent on sector s: $\delta_s > 1$ indicates that the sector is more decentralized than average. Figure 9 plots δ_s for some of the largest sectors, namely the health, transportation, electricity, agriculture, water, and education sectors. The health sector is 16 more decentralized than the energy sector, and agriculture is 10 times more decentralized than energy.

How did this continued centralized management of the power sector unfold? First, the 2010 constitution assigned responsibility for energy policy to both the national and the new county governments (GoK, 2010). These overlapping mandates created ambiguity about whether energy policy would be set and implemented nationally or subnationally (World Bank, 2017). As a result,

[25]See Rajasekhar (2021), Hamidi and Puspita (2022), Rodríguez (2018), Fedelino and Ter-Minassian (2010), and Faguet and Pal (2023).

[26]For evidence, see Boffa, Piolatto, and Ponzetto (2015), Prud'homme (1995), Fisman and Gatti (2002), Opalo (2014), Opalo (2020), Savage and Lumbasi (2016), and Hassan (2020b).

[27]See Lipscomb and Mobarak (2016) and Rios (2015).

[28]The mandate of the Ministry of Energy in Kenya was to operate the grid (generation, transmission, distribution), and to provide off-grid electricity. Oil and gas operations (including fuel subsidies) were overseen by the Ministry of Petroleum and Mining. In 2023 these two ministries merged to form the Ministry of Energy and Petroleum.

the central executive could retain significant political power in the electricity sector. As discussed in Subsection 2.2, recent appointees at top management positions of Kenya Power—made by the executive office—came from the political coalition of the incumbent president. Kenya Power—the country's public electric utility—was responsible for the implementation of the LMCP, and left county governments with little control over implementation. Indeed, in many African countries, devolution can have limited effects when legal mechanisms allow the national government to claim functions that fall under a local government's mandate (Hassan, 2020a).

At the parliamentary level, the high turnover of MPs in Kenyan elections often inhibits the development of specialized expertise, causing the legislature to often defer to the executive branch on technical matters (Opalo, 2022b). Compared with central ministries, county governments similarly had significantly less technical expertise to implement electricity projects. In interviews with stakeholders from Kenya Power, the Rural Electrification Authority, and the Kenyan government, Volkert and Klagge (2022) note widespread agreement that "a lack of skills, knowledge and experience of the county governments, their staff and possibly also the MPs... is the main challenge for a devolved electrification governance."

These legal and technical motivations for retaining executive control of the electricity sector reveal the vulnerability of large parastatals to political capture. This paper's main results therefore reflect significant de facto centralized governance. The bottom line is that decentralization may be ineffective or inefficient in constraining political favoritism in the electricity sector, and Subsection 8.3 discusses how this may threaten countries' ability to successfully manage the global energy transition.

8.2 Political accountability in Kenya

As noted above, the main estimates of political favoritism in this paper (versus the CDF allocation) range between 35 to 42%. While substantial in magnitude, this level of bias is smaller than what Kenya experienced between 1964–2002, when Kenya was largely under autocratic rule. Burgess et al. (2015) estimate 100-300% pro-government favoritism in nationwide road construction during this period; Barkan and Chege (1989) estimate 153% favoritism in road construction and 172% bias in healthcare investment around this time (Figure A15).

What can explain the stark contrast between earlier and current periods? A leading explanation is Kenya's democratic progress in the 2000s and early 2010s (Opalo, 2020; Burgess et al., 2015). Multiparty elections decreased the incidence of unilateral executive actions, offering evidence of increased legislative checks on executive authority. The Polity IV measure of democracy increased from 4 in 2001 ('anocracy') to 9 in 2013 ('consolidated democracy'), placing Kenya far ahead of its regional peers (Figure A1).

An independent media can also be a strong driver of democratization (Strömberg, 2015; Egorov and Sonin, 2024 provide reviews). The LMCP was highly publicized as a national government endeavor, and the list of sites was publicly announced in national and local news. Kenya has a relatively free press, consistently ranking at around the 65th percentile among lower-middle income countries in terms of press freedom (WPI, 2022). However, we are unable to readily quantify the impact of media scrutiny on favoritism in this context.

Thus, the glass is half-full: the levels of political favoritism documented in this study are far below those documented in earlier large-scale public programs in Kenya (Burgess et al., 2015) and less than many observers of Kenyan politics might predict (Figure A15). While decentralization may not be a suitable tool in the energy sector, there appear to be many other factors that can constrain favoritism, at least partially, in contemporary Kenya.

8.3 Favoritism in the global energy transition

Understanding the consequences of political favoritism in the energy sector is critical as electric grids will be responsible for implementing economic and engineering overhauls to meet ambitious global decarbonization goals (IEA, 2024). Electrification—replacing technologies as diverse as steel production, gasoline vehicles, and charcoal cookstoves with electric substitutes—is a primary mode of decarbonization, and one that will increase the scale and importance of the electric grid for the global economy.

In low-and middle-income countries (LMICs), these intensive margin pressures will be exacerbated by extensive margin growth. Between 2010 and 2020 global electricity access increased from 83% to 90%, representing an increase of almost 500 million people. Still, more than 600 million people in Africa alone lack access to electricity. Hundreds of millions of households are expected to join the grid in the coming decades, and connected households are expected to replace appliances with electric substitutes. LMICs are expected to drive the majority of growth in energy demand in the coming decades, and as a result, electric utilities in LMICs will play a crucial role in the clean energy transition (World Bank, 2024; EIA, 2023).

How do the differences in electricity market structures across low-, middle-, and high-income contexts affect the role of favoritism in the global energy transition? In the U.S., more than 250 companies own transmission lines serving over 4,000 distribution utilities (NAICS, 2024).[29] As geographically constrained renewables such as hydropower, geothermal, and wind are sited far from demand centers, decentralization has generated bottlenecks in connecting renewables to the grid, with experts now advocating for increased federal regulation and coordination (Cicala, 2021; Welton, 2024; Botterud et al., 2024).

Yet, across 46 African countries, 42 (91%) have a single nationwide transmission company and 38 (83%) have a single nationwide distribution company. More than 90% of these monopolies are majority government-owned (Table D11). Centrally managed grids might more efficiently deploy generation and expand transmission networks: for instance, electricity generation in East Africa is already dominated by renewables. Kenya's 2019 Lake Turkana Wind Power project expanded Kenya's generation capacity by 17%, and despite being sited in a remote, windy region—requiring the construction of 438 kilometers in high-voltage transmission lines—did not face subnational

[29] 71.4% of U.S. electricity customers get their electricity from one of 168 investor-owned utilities (with an average of 655,000 customers each). The rest get their power from cooperatives or publicly-owned utilities.

interconnection issues. The ministry's coordination of Kenya's public electricity networks may have helped bring this project on-line more quickly compared with a more decentralized transmission sector. Electricity distribution companies are also a textbook example of a natural monopoly, and may benefit substantially from centralized planning and management and from pooling power generators to minimize generation costs (Cicala, 2022).

At the same time, as shown in this paper, continued centralized management may increase the energy sector's vulnerability to political capture. Parastatals can be more vulnerable to political favoritism, threatening mistargeting and state capture of public resources (Briggs, 2021; Min, 2019; Mahadevan, 2024). Utilities in LMICs therefore face a key trade-off, especially given their tight budgets: 50 out of 52 utilities in Africa are facing severe financial constraints (Blimpo and Cosgrove-Davies, 2019; Kojima and Trimble, 2016), and these are expected to worsen as government-owned utilities face increased pressure to provide low-cost, universal access to electricity and to improve service quality by investing in grid maintenance and upgrading (Burgess et al., 2020). Despite the valuable potential technical efficiency gains from centralization, continued centralized management of the electricity sector may make it more vulnerable to political capture and favoritism.

9 Conclusion

This paper studies the effects of political favoritism in the context of Kenya's $788 million national electrification project. The analysis uses fine-grained electricity infrastructure and network construction data, combined with ward-level electoral outcomes and administrative data on household income and electricity consumption. The primary estimates of favoritism compare the observed allocation against an objective and transparent formula—the Constituency Development Fund (CDF) allocation rule—that had been agreed upon by pro-government and opposition members of parliament more than a decade prior to the project's launch in the spirit of promoting equity.

Even in this relatively democratic context, we find evidence of significant levels of political favoritism: constituencies that had earlier voted for the president received around 35 to 42 % more household electricity connections than constituencies that voted for the opposition, relative to the official allocation that the government had committed to. A decomposition of the various stages of rural electrification shows that favoritism was driven by the two stages that were implemented centrally, and that there was no sign of favoritism in stages that were implemented locally. While locally elected MPs were consulted in the planning process, there is little evidence that they allocated electrification programs in a clientelistic way.

This paper makes a significant contribution to the existing literature on political favoritism by integrating the political favoritism results into a formal framework of economic surplus. By contrasting observed allocations with counterfactual policies, this allows us to evaluate the implications of political favoritism for efficiency and equity goals. Perhaps surprisingly, we estimate that the observed allocation generated *more* economic surplus than what would have been generated under the government's official policy allocation (the CDF formula). Furthermore we simulate what the surplus maximizing allocation would look like and it is coincides with neither the official policy rule nor with equal allocation across all households. This is a departure from some existing literature that has assumed that any deviations from the stated rule or the benchmark of equal allocations are evidence of social welfare lowering political favoritism.

The findings also offer a more nuanced perspective on the trade-off between efficiency and equity. Political favoritism in the context of this program served to lower the aggregate surplus gain generated for households that voted for the opposition and for the country's poor, pointing to significant political and economic inequities in how the surplus gains were distributed. In addition, even greater aggregate surplus gains could have been achieved without introducing any political bias at all. In other words, the political favoritism we document appears unjustified both in terms of efficiency and equity goals in this context. While our estimates show a moderate increase in economic surplus in the short-term due to the deviation from the official program allocation, the inequality that it induces between pro-government and pro-opposition areas may lead to substantial political discontent that could undermine political legitimacy and ultimately corrode democratic institutions. More speculatively, these adverse institutional consequences might generate long-run costs that outweigh the modest economic surplus gains.

In the coming decades, decarbonization efforts will require trillions of dollars in new investments globally to accommodate growing demand for electrical power and expanded renewable energy generation. This paper's findings underscore potential political economy difficulties in managing these investments and highlight the limitations of decentralization for constraining political favoritism in the clean energy transition.

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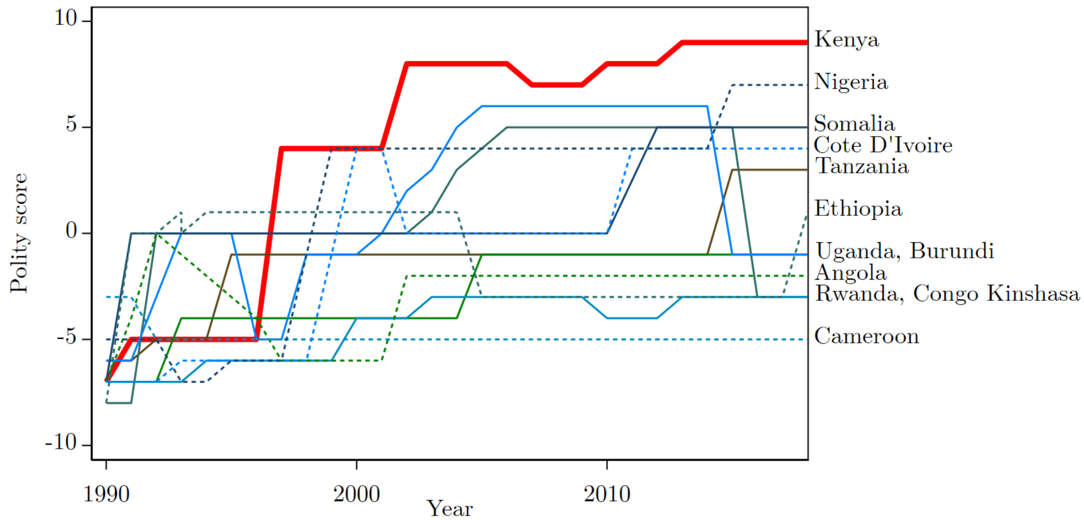
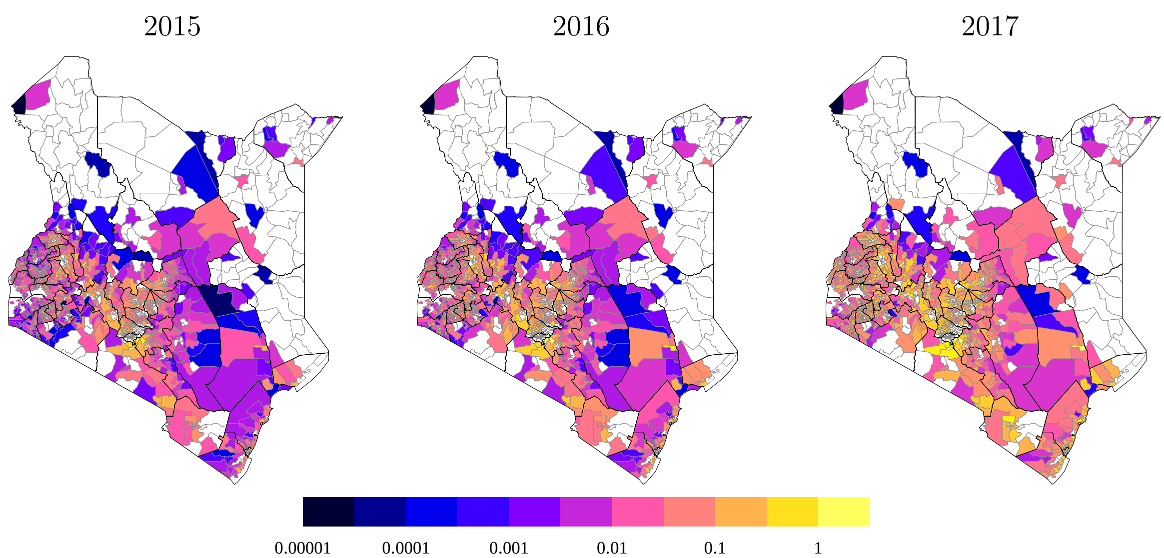
A Appendix Figures

Figure A1: Polity democracy scores among countries in Africa



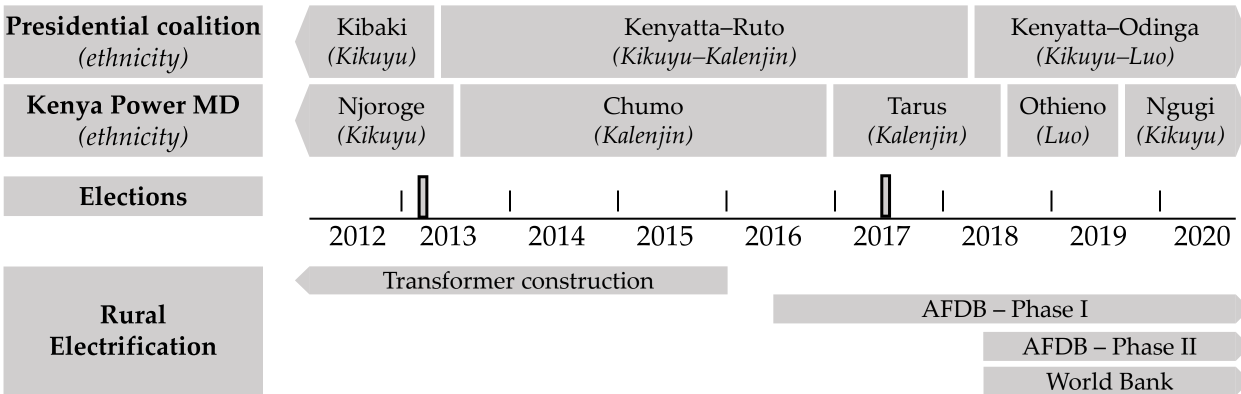
Polity democracy scores for countries in Africa. Solid lines represent countries in the East African Community. Dashed lines are other countries in Africa with GDP per capita similar to Kenya. Source: Marshall and Gurr (2020).

Figure A2: Residential meters per household by ward (log)



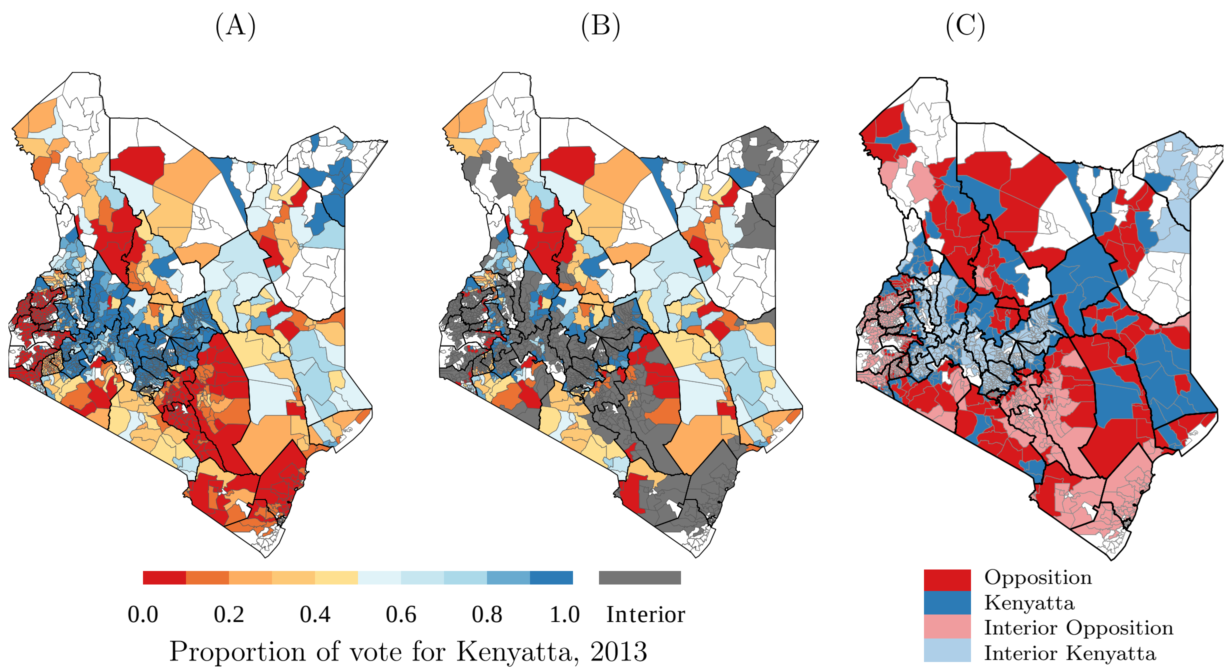
Ward-level population comes from the 2009 census after applying a uniform growth rate based on country-level population growth from UN WPP (UN, 2022). Units are residential meters per household, with shading following a log10 scale. White wards contain no residential meters in our dataset or are missing 2009 population data.

Figure A3: Timeline of political and Kenya Power events, 2013-2022



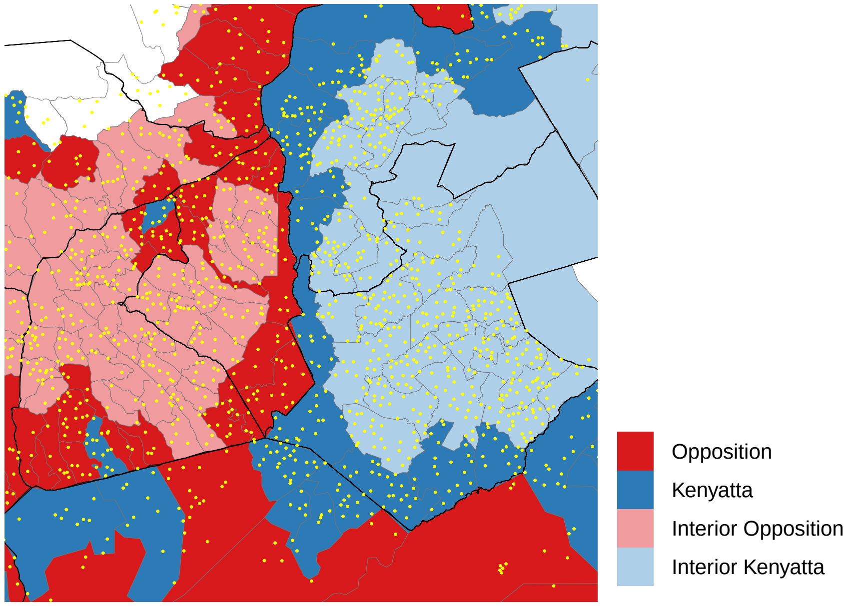
Timeline of Kenyan presidential terms, Kenya Power managing director appointments (MD), elections, and rural electrification. Kenyatta was inaugurated on April 9th, 2013 and again on November 28th, 2017. The 'Handshake' between Kenyatta and Odinga took place on March 9th, 2018.

Figure A4: 2013 Kenya presidential election results



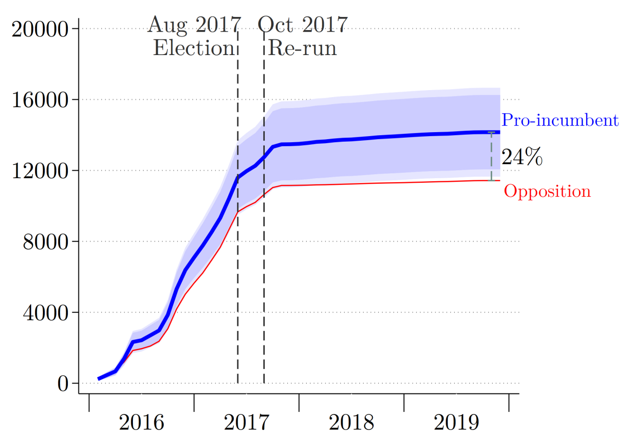
Blue wards had vote shares of over 50% for Kenyatta. Red wards had vote shares under 50% for Kenyatta. White wards are missing election data. Panel A shows 2013 presidential election results at the ward level. Panel B shows the same, but 'interior' wards—which only border similarly aligned wards—are greyed out. Panel C shows a binary version, with adjacent wards shown in dark.

Figure A5: Adjacent wards with LMCP sites (example area)



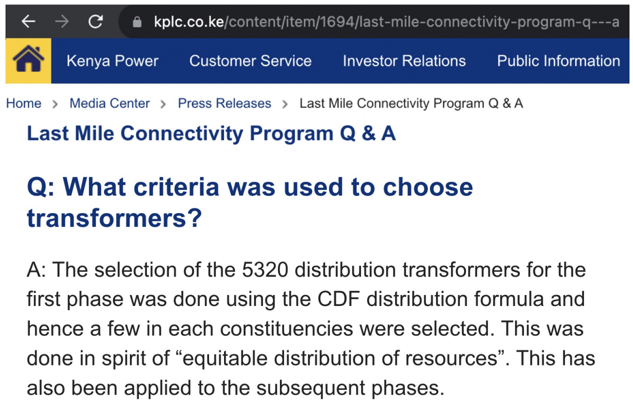
Region mapped contains primarily Bomet, Kisii, Nyamira, Kericho counties. Blue (red) wards had vote shares of over (under) 50% for Kenyatta. White wards are missing election data. Darker (lighter) wards represent adjacent (interior) wards. Yellow dots show the locations of transformers which were selected for maximization under LMCP.

Figure A6: Number of meters activated in or after 2016 at LMCP sites per 100,000 households



Results from the following regression: $y_{it} = \sum_{k=1}^{118} \gamma_k D_{it}^k + \sum_{k=1}^{118} \beta_k D_{it}^k * ProGovernment_i + \epsilon_{it}$ (no socio-economic controls). The red line plots the γ_k's while the blue line plots $\gamma_k + \beta_k$. The gap between the blue and red lines represents the difference between opposition and pro-government wards (β_k's). The darker (lighter) blue is the 90% (95%) confidence interval of the β_k's. The vertical line denotes the August 2017 Presidential election. Figure 2 shows a version without political breakdown in absolute terms. Figure D7 provides versions with controls, per capita, and per Constituency Development Fund (CDF) allocation. Figure D9 and Figure D8 provide versions for construction progress. Table B3 presents equivalent regression results.

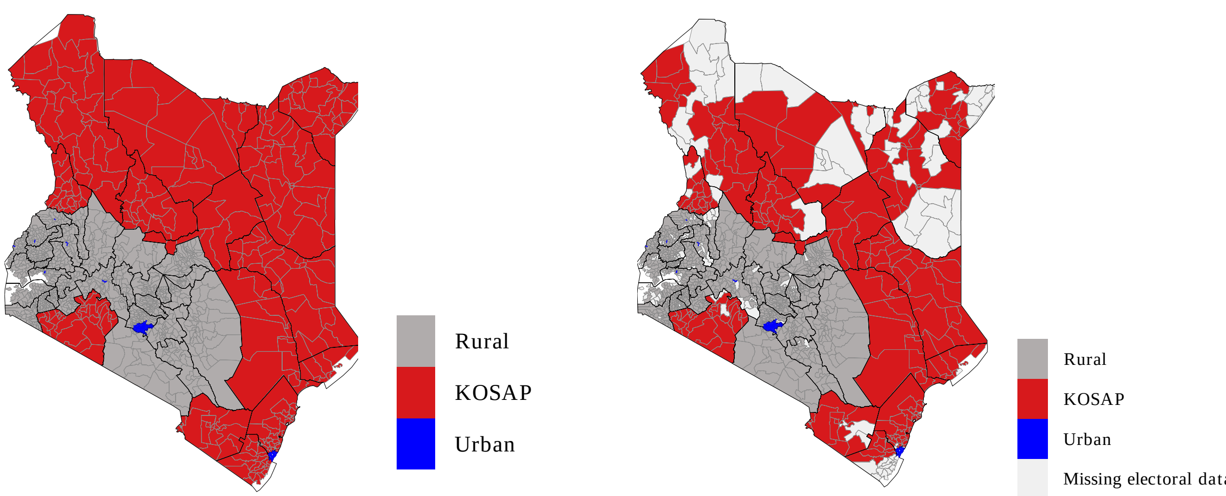
Figure A7: Kenya Power website announcement



Note: The Kenya Power website announced that LMCP transformers would be allocated to constituencies according to the Constituency Development Fund (CDF) formula. Source: Kenya Power (2016).

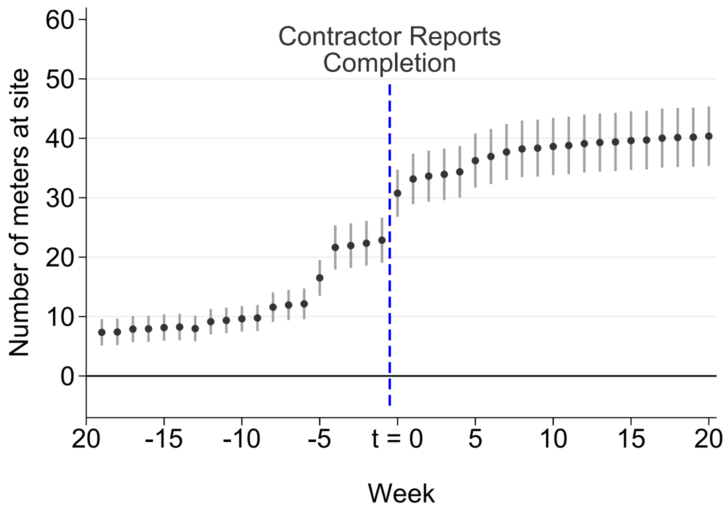
Figure A8: Main sample specification: omitted urban and sparse areas

(A) All wards (B) Only wards with electoral data



Wards labelled “rural” (in gray) form the main sample of LMCP wards (see Section 3 for a detailed description of sample construction). Wards shaded red are in counties targeted by KOSAP, an off-grid solar electrification project. Wards shaded blue are within Nairobi and Mombasa counties or are in a ward with an equal or greater population density (3,513 population per square km). Wards shaded white in panel B are missing 2013 election data.

Figure A9: Meters activated in Kenya Power infrastructure database relative to when contractors report construction completion



This figure combines Kenya Power's meter data with construction progress data at the transformer level provided by independent contractors. In the weeks after a contractor reports construction at a particular transformer to have been complete, the number of meters that Kenya Power identifies as going on-line increases sharply up to on average 40, in line with estimates of the number of unconnected households living within 600 meters of each LMCP transformer (as discussed in Subsection 2.3). Point estimates and standard errors from a stacked difference-in-differences estimates of the number of meters installed in the 20 weeks before and after a contractor reports construction completion, relative to sites that were not yet completed during that period (Deshpande and Li, 2019; Cengiz et al., 2019; Goodman-Bacon, 2021).

Figure A10: Correlation between two measures of pre-LMCP connectivity:

(A) By ward ($R^2 = 0.75$) (B) By constituency ($R^2 = 0.83$)

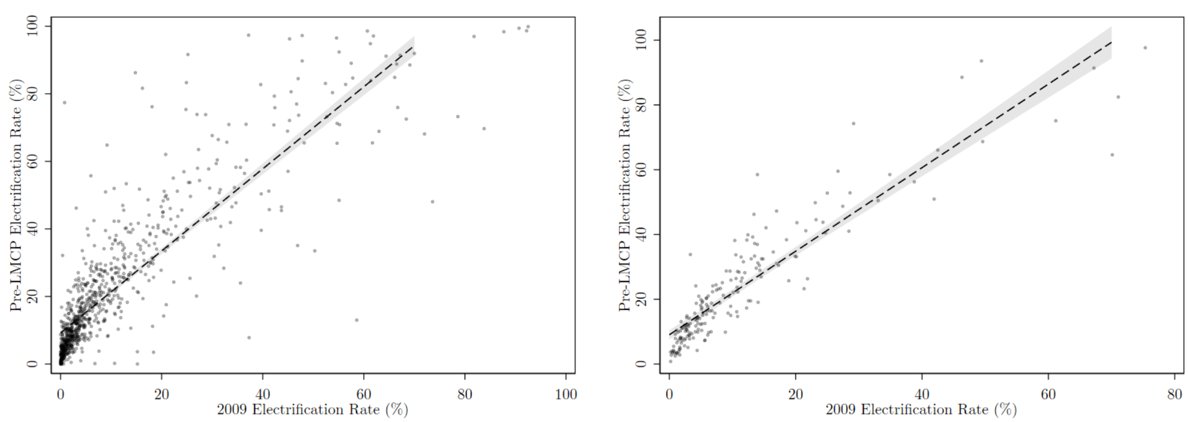
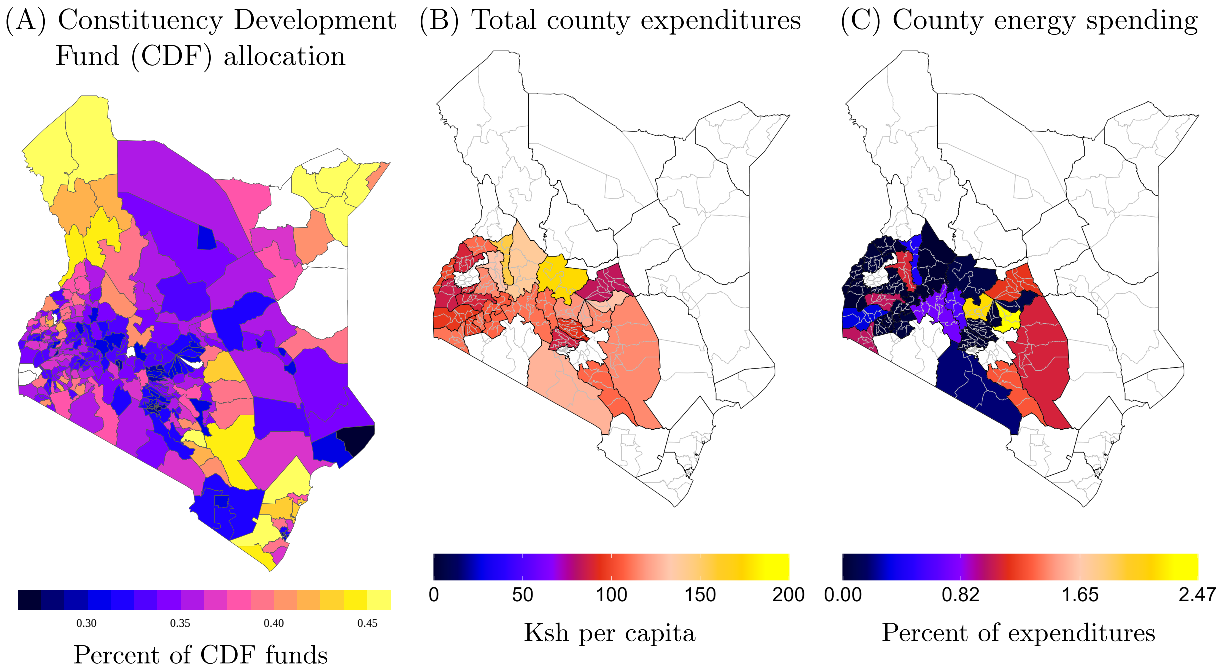
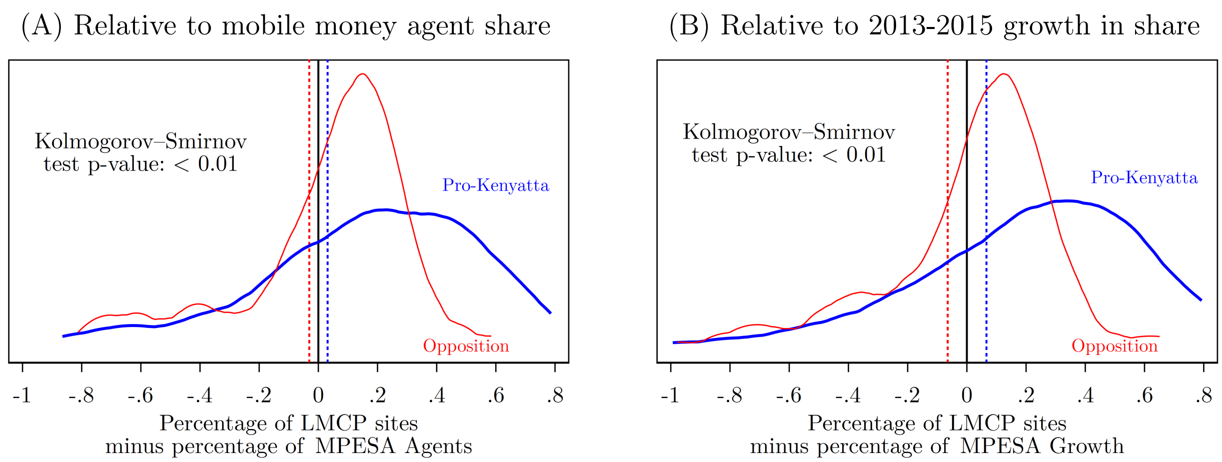


Figure A11: County and constituency expenditures in 2015



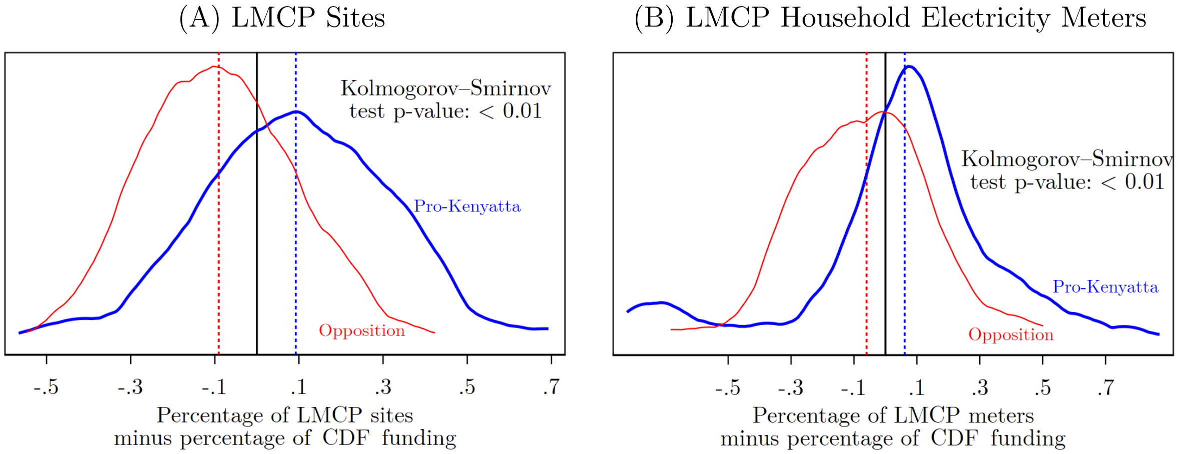
Panels B and C omit urban and sparsely populated counties (see Subsection 3.1 for more detail) and Machakos and Kakamega because of incomplete reporting (Kenya's Office of the Controller of Budget, 2022)

Figure A12: Constituency LMCP site shares relative to mobile money shares by 2013 election result



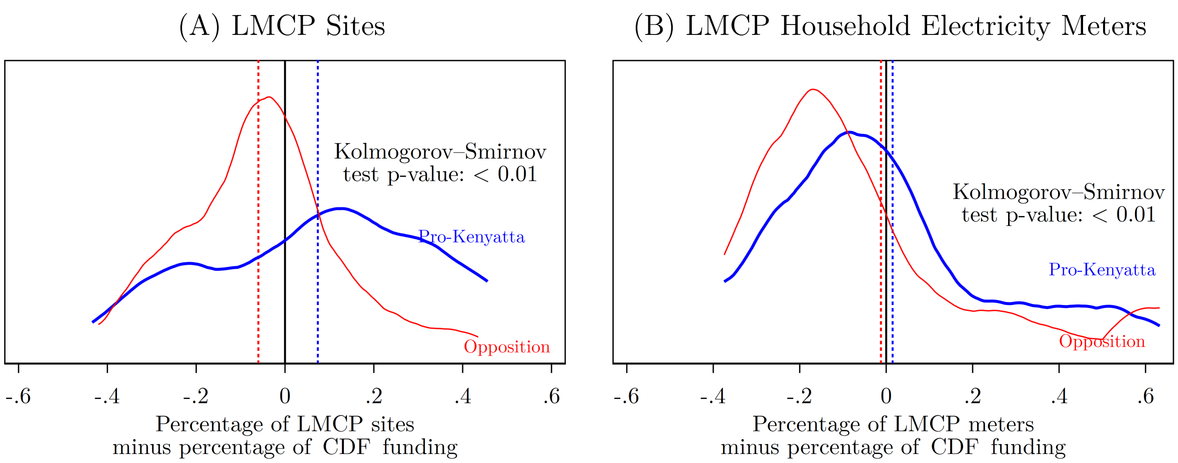
Differences between a constituency's percentage of LMCP sites minus its share of mobile money agents (panel A) or its share of new mobile money agents in 2014/2015 (panel B), by whether constituencies voted pro-government in the 2013 presidential election, bottom- (top-) coded at the 5th (95th) percentile. Both panels include only rural constituencies. Vertical dashed lines present the sample means.

Figure A13: Residuals of constituency LMCP shares relative to Constituency Development Fund (CDF) shares by 2013 election result



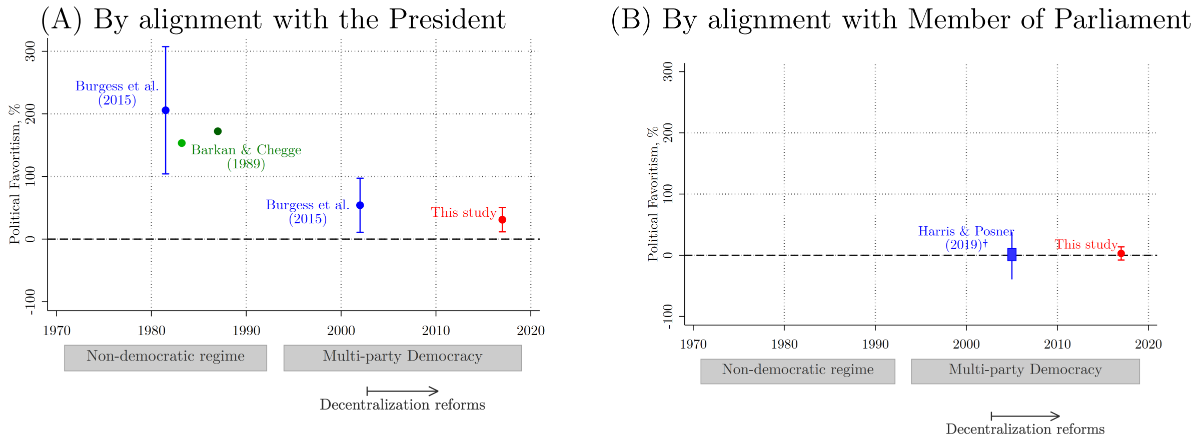
The residual of constituency's share of nationwide LMCP outcomes after controlling for socio-economic variables (as in Column 2 of Table 1) minus its share of CDF funding, by whether constituencies voted pro-Kenyatta in the 2013 presidential election. Panel A shows LMCP sites selected. Panel B shows LMCP household meters activated. Vertical lines indicate sample means. Shares are normalized according to the same sample as in Table 1. Figure 3 presents a version with raw data. Figure D5 presents a scatter plot version.

Figure A14: LMCP outcomes relative to Constituency Development Fund (CDF) shares by 2013 election result (nationwide sample)



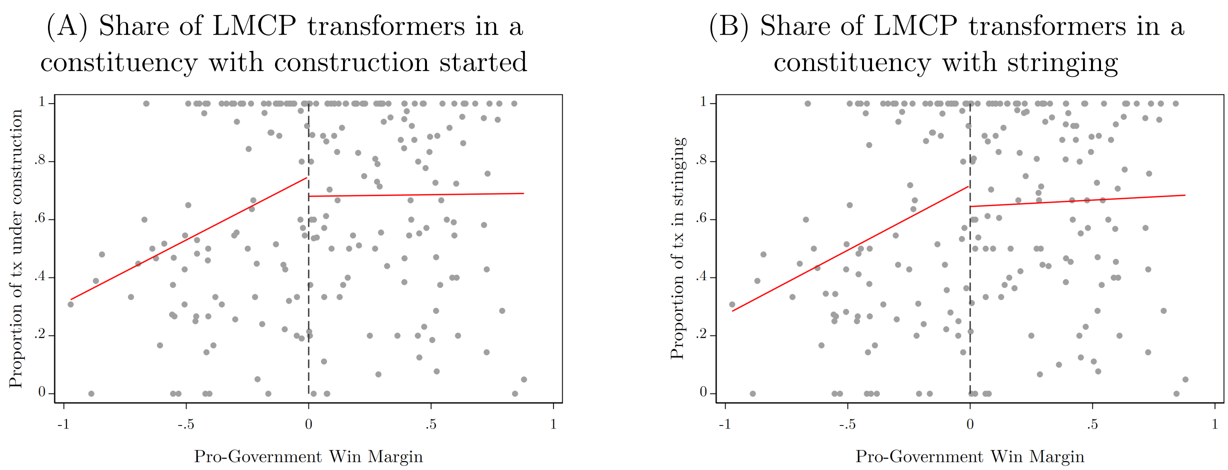
This figure shows the same as Figure 3 but for all wards nationwide. A constituency's percentage of LMCP sites minus its share of CDF funding, by whether constituencies voted pro-government in the 2013 presidential election, bottom- (top-) coded at the 5th (95th) percentile. Vertical lines indicate sample means.

Figure A15: Estimates of favoritism



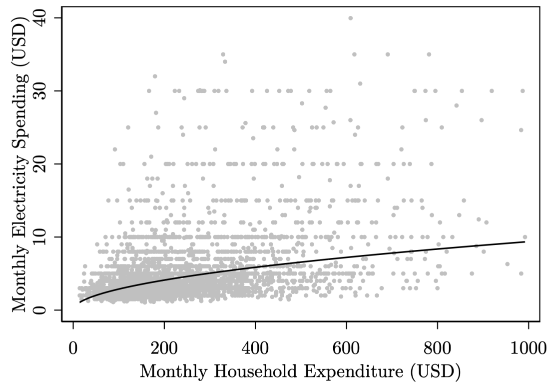
Panel A: Estimate for "this study" from Table 1. Estimates for Burgess et al. (2015) use results in Table 1 (Column 4, Panel B) on road expenditures per capita. Estimates for Barkan and Chege (1989) are on road expenditure (light green) and health expenditure (dark green). Panel B: Estimate for this study taken from Column 7 of Table 4. †: Box and whisker plot based on estimates of favoritism in each constituency, as reported in Harris and Posner (2019).

Figure A16: Share of constituency's LMCP transformers with construction progress



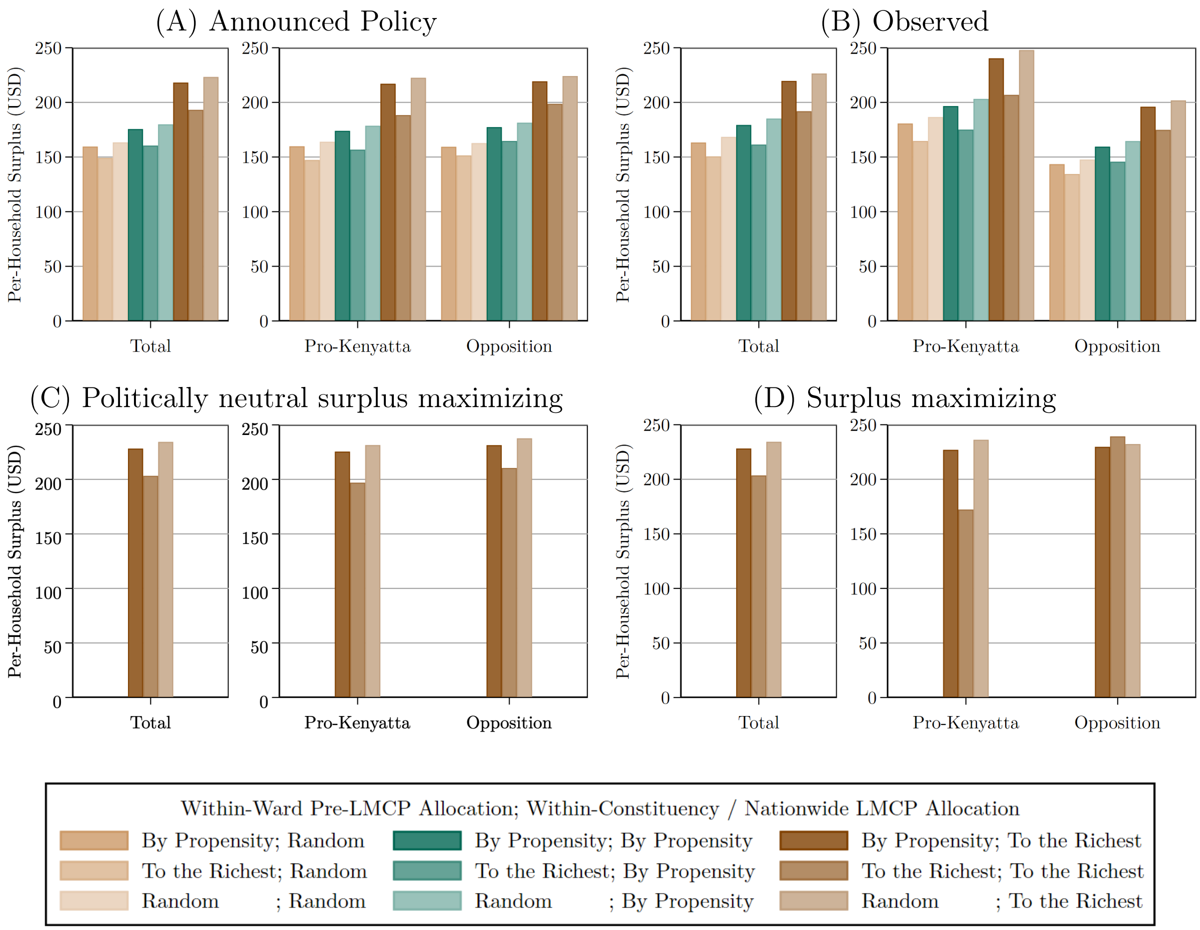
Note: Similar to Figure 4 but using two main construction outcomes as the main outcome variables. Panel A shows the fraction of a constituency's LMCP transformers where construction started. Panel B shows the fraction of a constituency's LMCP transformers where stringing had been completed.

Figure A17: Estimated relationship between electricity spending and total household consumption



Note: Data source: 2016 Kenya Integrated Household Budget Survey (KNBS, 2016). To reflect the LMCP target population we include rural households only.

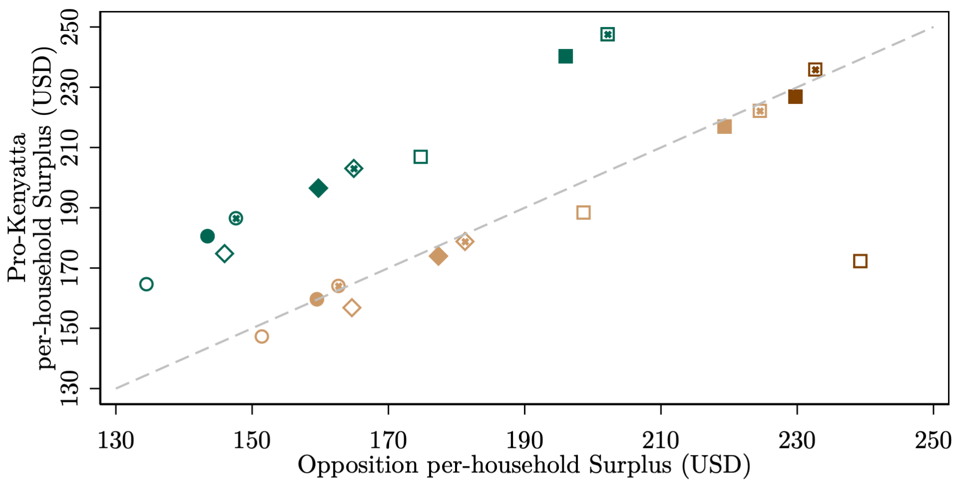
Figure A18: Consumer surplus per ex-ante unconnected household in all simulated scenarios



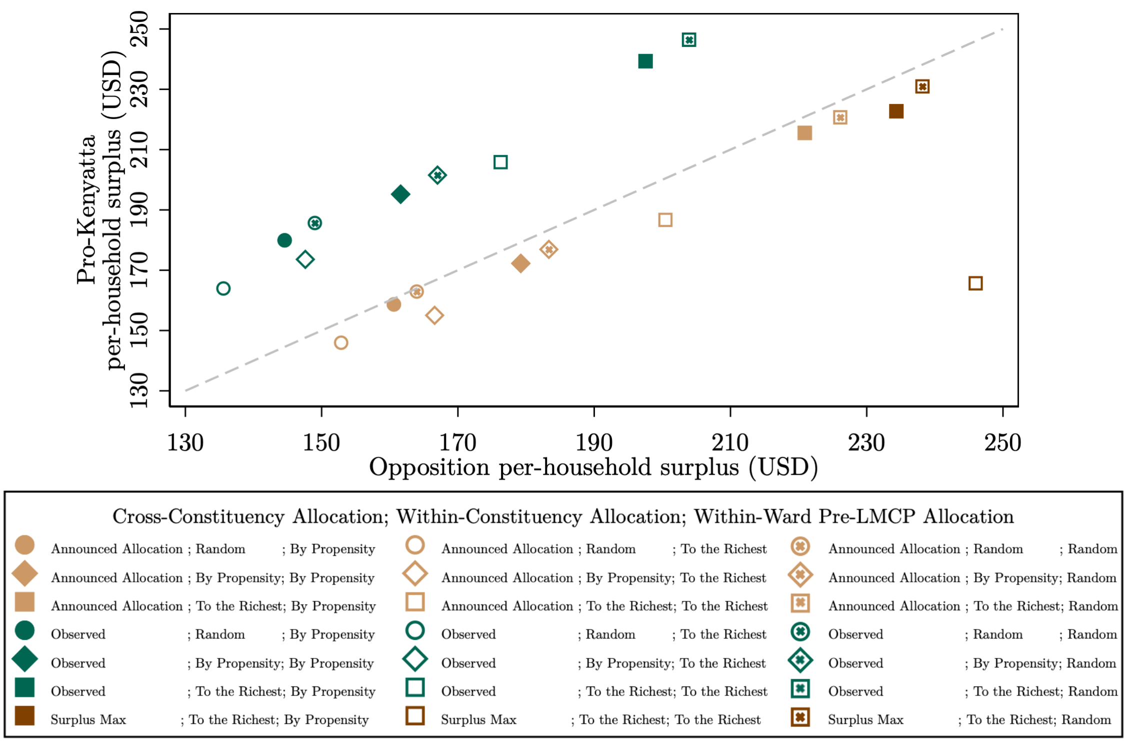
Note: The Announced Policy allocation follows the Constituency Development Fund. LMCP allocation refers to within-constituency under the (A) Announced policy allocation and (B) Observed cross-constituency allocations; LMCP allocation refers to nationwide for the (C) Politically neutral surplus-maximizing allocation. (D) Surplus-maximizing allocation. Consumer surplus assumes -0.3 demand elasticity of electricity and 10% annual growth of electricity usage over the 30-years lifetime of connection.

Figure A19: Robustness checks: Consumer surplus by political affiliation

(A) Assigning households to political affiliation by constituency vote share

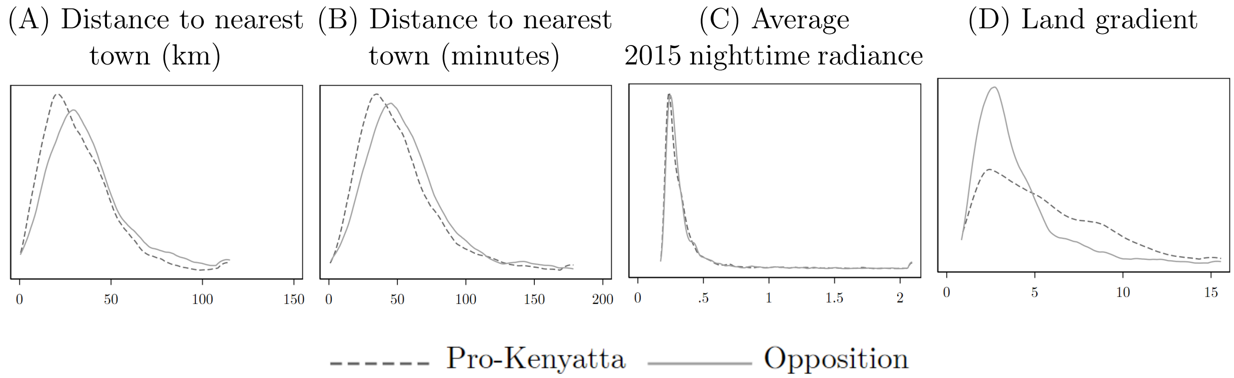


(B) Assigning households to political affiliation by constituency's winning party



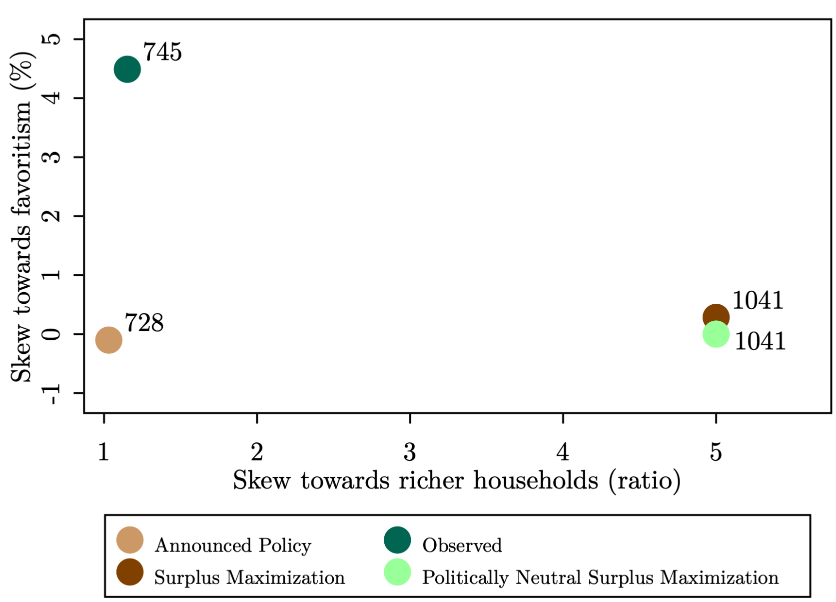
Note: The Announced Policy allocation follows the Constituency Development Fund. Consumer surplus numbers reflect averages per ex ante unconnected household, reflecting both each household's propensity to be connected and the expected consumer surplus gain from the connection. All estimates assume a -0.3 demand elasticity of electricity and 10% annual growth of electricity usage over the 30-years lifetime of connection. In panel A, households are assigned to political affiliation reflecting each constituency's vote share. In panel B, households are labeled as Pro-Kenyatta if 50% or more of the vote share in their constituency was for Kenyatta; otherwise, they are labeled as Opposition households.

Figure A20: Balance across factors that could affect construction cost



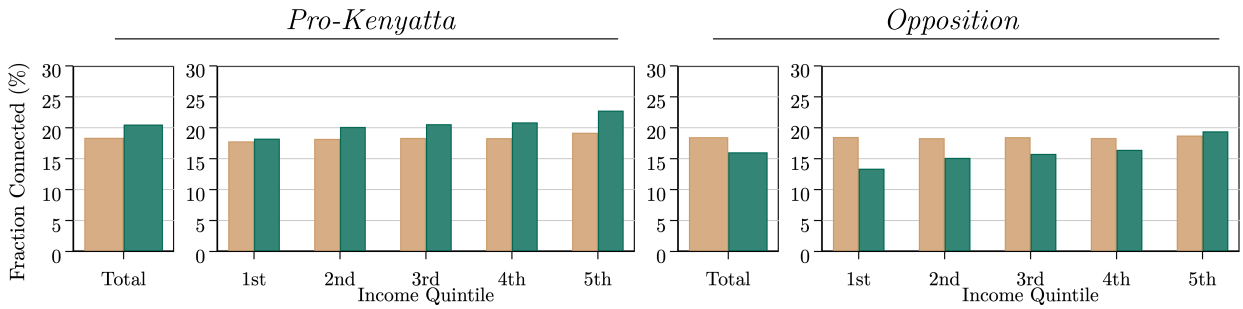
Note: Panels A and B show road distance from each site to the nearest 'major town' (WRI, 2007; HERE, 2022). Panel C shows average site-level nighttime radiance in 2015 measured using VIIRS averaged across the 600 meter radius (Elvidge et al., 2017). Panel D shows average site-level land gradient recorded using the 90-meter Shuttle Radar Topography Mission Global Digital Elevation Model (2018).

Figure A21: Total consumer surplus in million USD across scenarios by political and income bias



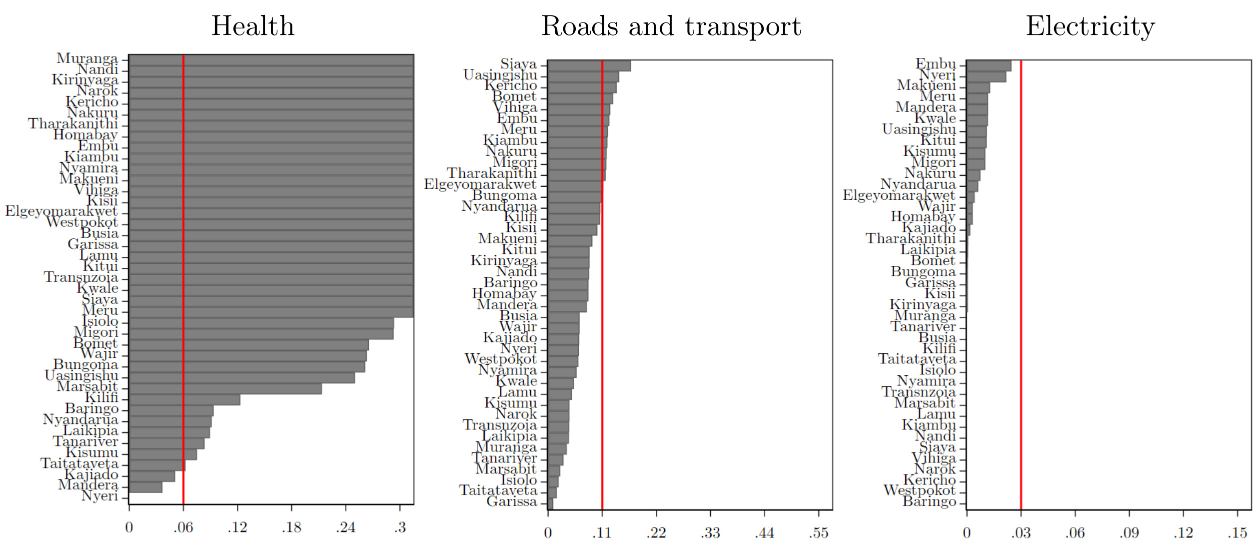
Note: The Announced Policy allocation follows the Constituency Development Fund. Skew towards favoritism represents the percentage point difference between previously unconnected pro-Kenyatta and opposition households who received connection through LMCP. Skew towards richer households is the fraction of previously unconnected households that receive connection through LMCP that are in the highest income quintile of unconnected households, divided by 20%, which would be the equitable allocation

Figure A22: Households connected, by 2017 presidential outcome and income quintile



Note: Fraction of ex ante unconnected households that were connected through the LMCP.

Figure A23: Fraction of county and ministerial spending spent on each sector



This figure compares each county's expenditures in a given sector with the national government's expenditures in that same sector (through the corresponding ministry). The gray bars plot the fraction of its public expenditures that each of the 47 counties spends on health, roads and transport, and energy (top-coded at 33%; Muranga spends 49.7% of its budget on health; Kericho, Narok, Kirinyaga and Nandi all spend between 40-42%). For comparison, the vertical red line shows the fraction of total ministerial budget that is spent by the ministry responsible for that sector 2022). For comparability, the x-axis is normalized to be five times the ministerial average. The gray bars indicate the fraction county spending assigned to that sector, top-coded at 33% for the health sector (Kenya Office of the Controller of Budget, 2022). 'Roads and transport' spending primarily funds road construction and maintenance, but occasionally includes public transportation, railways, or ports. County energy spending is primarily household electrification and streetlight construction.

B Appendix Tables

Table B1: Determinants of Constituency Development Fund allocations to constituencies over time

	2003–2015			2016–2021		2022–	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	9.29***	8.48***	6.83***	9.36	9.36	10.01***	7.64***
	(0.10)	(0.21)	(0.41)	(.)	(.)	(0.05)	(0.00)
2013 Kenyatta voteshare (%)	-0.50***	-0.01	-0.22	0.00	0.00	0.01	-0.00
	(0.17)	(0.11)	(0.18)	(.)	(.)	(0.09)	(0.00)
Poverty index (2009)		0.36***			0.00		0.00***
		(0.03)			(.)		(0.00)
Poverty index (2005)			1.47***				
			(0.29)				
Population		0.54***	0.03		0.00		-0.00
		(0.08)	(0.13)		(.)		(0.00)
Ward count		0.11**	0.32***		0.00		0.47***
		(0.04)	(0.07)		(.)		(0.00)
Observations	290	286	229	290	286	289	285
Mean	9.1	9.1	9.1	9.4	9.4	10.0	10.0
R2	0.03	0.71	0.28	.	.	0.00	1.00

Columns 1–3, 4–5, and 6–7 use the allocations (hundred thousands 2016 USD) from 2013, 2017, and 2022, respectively, but allocations were proportional in each period. Ward counts are from 2013 administrative boundaries, consistent with those used by the 2023-24 NG-CDF Committee (GoK, 2023). The R^2 in Columns (2) and (3) of do not equal 1 because the exact constituency poverty index formula is not public. We approximate it using 2005 and 2009 Census Data. For Column (7), the regression is not perfectly collinear because of minor rounding in the allocations. $^{*} \leq 0.10, ^{**} \leq .05, ^{***} \leq .01$.

Table B2: Summary statistics

	2009	2019
Wards	n/a[c]	1,450
Constituencies	210[d]	290
Counties	n/a[c]	47
Population (millions)[a]	38.6	47.6
Households using grid electricity as main lighting source[a]	22.7%	50.4%
Households using solar panels as main lighting source[a]	1.6%	19.3%
Electricity meters (millions)[b]	1.3	7.1
Residential electricity meters (millions)[b]	1.0	6.7
Electrical transformers[b]	30,000[e]	62,271

[a]Source: Kenyan Census (2009; 2019). [b]Source: Kenya Power annual reports (2012; 2022). [c]Counties were created in the 2010 Constitution. [d]The number of constituencies changed from 210 to 290 in the 2010 Constitution. [e]Authors' calculation based on capacity growth rates.

Table B3: Favoritism in LMCP (meter panel data)

	(1)
Pro-Govt Effect, Dec 2016	1359.35**
	(641.52)
Pro-Govt Effect, Dec 2017	2325.01*
	(1228.72)
Pro-Govt Effect, Dec 2018	2622.13**
	(1255.64)
Pro-Govt Effect, Dec 2019	2728.60**
	(1268.26)
Observations	42624
Opposition Mean, Dec 2016	5022.30
Opposition Mean, Dec 2017	11154.30
Opposition Mean, Dec 2018	11304.63
Opposition Mean, Dec 2019	11428.82

Results from the following regression: $y_{it} = \sum_{k=1}^{118} \gamma_k D_{it}^k + \sum_{k=1}^{118} \beta_k D_{it}^k * ProGovernment_i + \epsilon_{it}$. Listed coefficients are estimated β_k values; listed opposition means are estimated γ_k values. The estimates in this table correspond to Figure A6. Estimates are in units of meters per 100,000 households.

Table B4: Political favoritism in LMCP sites per 100,000 households

	In absolute terms			Relative to CDF Allocation		
	(1)	(2)	(3)	(4)	(5)	(6)
Voted pro-govt in 2013	50.6***	62.6***	58.7***	69.4***	63.7***	63.4***
	(10.6)	(11.2)	(8.13)	(18.4)	(19.4)	(12.1)
Observations	911	911	911	196	196	196
Opposition Mean	149	149	149	151	151	151
Effect Size (%)	34	42	39	46	42	42
Controls	None	SES	LASSO	None	SES	LASSO
Sample	Wards	Wards	Wards	Consts	Consts	Consts

In Columns 1–3, y_i is the number of LMCP sites per 100,000 households. In Column 4–6, y_i is the same but minus the hypothetical number had meters been allocated according to the Constituency Development Fund (CDF). Columns 2 and 5 controls for land gradient, population density, baseline share of households that are unconnected, share adults with primary or secondary education, share adults who work for pay, dependency ratio, share households with an iron roof, population density, household size, mobile money agents as of 2013 per capita, and change in mobile money agents between 2013 and 2015 per capita. Column 3 uses post-double selection LASSO (Belloni, Chernozhukov, and Hansen, 2013; Ahrens, Hansen, and Schaffer, 2020) to flexibly select from a subset of quadratic and cubic interactions between this same set of variables. Table 1 presents the same analysis for LMCP meters per 100k households. $^* \leq 0.10, ^{**} \leq .05, ^{***} \leq .01$.

Table B5: Placebo Test: Political Favoritism in Rollout of New M-Pesa Agents (2013-2015)

	In absolute terms			Relative to CDF Allocation		
	(1)	(2)	(3)	(4)	(5)	(6)
Voted pro-govt in 2013	16.3	-75.4	-83.5	54.9	-50	-11.4
	(37.6)	(58.8)	(58.5)	(48.5)	(58.3)	(52.9)
Observations	911	911	911	196	196	196
Opposition Mean	291	291	291	319	319	319
Effect Size (%)	5.6	-26	-29	17	-16	-3.6
Controls	None	SES	LASSO	None	SES	LASSO
Sample	Wards	Wards	Wards	Consts	Consts	Consts

In Columns 1–3, y_i is the number of new M-PESA agents added in 2013-2015 per 100,000 households. In Column 4, y_i is the same but minus the hypothetical number had agents been allocated according to the Constituency Development Fund (CDF). Sample in all regressions excludes urban wards and KOSAP wards. Columns 2 controls for land gradient, population density, baseline share of households that are unconnected, share adults with primary or secondary education, share adults who work for pay, dependency ratio, share households with an iron roof, population density, household size, mobile money agents as of 2013 per capita, and change in mobile money agents between 2013 and 2015 per capita. Column 3 uses LASSO to flexibly select from a subset of quadratic and triple interactions between this same set of variables. Column 4 does not include socio-economic controls. $^{*} \leq 0.10,^{**} \leq .05,^{***} \leq .01$.

Table B6: Economic surplus by income quintile and political affiliation under different LMCP allocations (million USD)

Assumptions			Total consumer surplus by income quintile					Total consumer surplus by political affiliation				
Demand Elasticity (ϵ_D)	**Annual Electricity Spending Growth (%)**	**Total Consumer Surplus**	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Pro-govt**	**Opposition**	**Political favoritism (ratio)**	**Total Surplus**	**Return on investment (%)**
		Observed										
-0.15	0	663	74	103	124	149	214	391	272	1.3	320	93
-0.15	10	1490	167	231	278	334	480	879	611	1.3	1147	334
-0.30	0	333	37	52	62	75	107	196	136	1.3	-10	-3
-0.30	10	745	84	115	139	167	240	439	305	1.3	402	117
-0.45	0	222	25	34	41	50	71	131	91	1.3	-121	-35
-0.45	10	496	56	77	93	111	160	293	203	1.3	153	45
		Announced Policy										
-0.15	0	648	84	105	124	145	190	346	302	1.0	305	89
-0.15	10	1456	189	236	279	325	427	777	679	1.0	1113	325
-0.30	0	325	42	53	62	72	95	174	152	1.0	-18	-5
-0.30	10	728	95	118	140	162	214	389	340	1.0	385	112
-0.45	0	217	28	35	42	48	64	116	101	1.0	-126	-37
-0.45	10	485	63	79	93	108	142	259	226	1.0	142	41
		Surplus Maximization										
-0.15	0	927	0	0	0	0	927	492	436	1.0	584	170
-0.15	10	2083	0	0	0	0	2083	1104	978	1.0	1740	507
-0.30	0	465	0	0	0	0	465	247	219	1.0	122	36
-0.30	10	1041	0	0	0	0	1041	552	489	1.0	698	204
-0.45	0	310	0	0	0	0	310	164	146	1.0	-33	-10
-0.45	10	693	0	0	0	0	693	368	326	1.0	350	102
		Politically Neutral Surplus Maximization										
-0.15	0	927	0	0	0	0	927	489	439	1.0	584	170
-0.15	10	2083	0	0	0	0	2083	1097	985	1.0	1740	507
-0.30	0	465	0	0	0	0	465	245	220	1.0	122	36
-0.30	10	1041	0	0	0	0	1041	549	493	1.0	698	204
-0.45	0	310	0	0	0	0	310	163	147	1.0	-33	-10
-0.45	10	693	0	0	0	0	693	365	328	1.0	350	102

Note: The Announced Policy allocation follows the Constituency Development Fund. All surplus numbers are 15% discounted sum of surplus from consuming electricity over the life of the connection (30 years), and assume pre-LMCP meters are allocated by propensity. All surplus numbers are in million 2019 USD. LMCP cost is 35 billion KSH (343 million USD) until the end of 2019 (Auditor-General, 2023). Politically neutral surplus maximization connects the same fraction of unconnected pro-government households as unconnected opposition households. Constituency Development Fund and Observed scenarios allocate meters to ex ante unconnected households randomly within each constituency. The political favoritism ratio is calculated by dividing the ratio of Pro-govt surplus to Opposition surplus by the ratio of Pro-govt ex-ante unconnected households to Opposition ex-ante unconnected households. A ratio of 1 indicates that surplus is allocated politically fairly with respect to the number of households that were unconnected at the start of the program.

C Proofs

Claim: The net utility gain from access to electricity is greater for high income agents than for low income agents (see Subsection 6.1):

$$\frac{\partial U}{\partial Y} = \frac{\partial u_e(e_a)}{\partial Y} + \frac{\partial u_c(c_a)}{\partial Y} - \frac{\partial u_c(c_n)}{\partial Y}$$

Using the chain rule:

$$\frac{\partial U}{\partial Y} = \frac{\partial u_e(e_a)}{\partial e_a}\frac{\partial e_a}{\partial Y} + \frac{\partial u_c(c_a)}{\partial c_a}\frac{\partial c_a}{\partial Y} - \frac{\partial u_c(c_n)}{\partial c_n}\frac{\partial c_n}{\partial Y}$$

For simplicity normalize units such that $p_e = p_c = 1$. Since the agent can only consume two goods, $\frac{\partial e_a}{\partial Y} + \frac{\partial c_a}{\partial Y} = 1$. Since without access to electricity the agent spends all money on other consumption goods, we have $\frac{\partial c_n}{\partial Y} = 1$. Since the agent equalizes marginal utilities at the optimum we also have $\frac{\partial u_e(e_a)}{\partial e_a} = \frac{\partial u_c(c_a)}{\partial c_a}$. The equation above now simplifies to:

$$\frac{\partial U}{\partial Y} = \frac{\partial u_c(c_a)}{\partial c_a} - \frac{\partial u_c(c_n)}{\partial c_n}$$

Since $c_a < c_n$, by the curvature of the utility function we have $\frac{\partial u_c(c_a)}{\partial c_a} > \frac{\partial u_c(c_n)}{\partial c_n}$ and thus $\frac{\partial U}{\partial Y} > 0$.