PEDL Research Papers

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Money or power? Financial infrastructure and optimal policy

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Abstract

In response to the Covid-19 crisis, 186 countries implemented direct cash transfers to households, and 181 introduced in-kind programs that lowered the cost of utilities such as electricity, water, transport, and mobile money. During times of crisis, do people prefer cash or in-kind transfers, and why? To study this, we ran surveys with more than 2,000 respondents across two separate contexts: urban Kenya and urban Ghana. In urban Kenya 95% of recipients prefer mobile money over electricity transfers of a similar monetary value. But Kenya is an outlier with high mobile money adoption: this likely increases its value and reduces the transaction cost of buying electricity credit. In contrast, in urban Ghana—where mobile money is less widespread and the transaction costs for buying electricity are higher—half of recipients prefer electricity transfers, and many are willing to forego significant value to receive electricity instead of mobile money. While other differences may also contribute to the gap, these results point to a large role for local financial infrastructure. This may affect optimal government policy in response to an economic crisis: the adoption of modern financial technologies increases the efficiency of cash transfer programs, even as in-kind transfers continue to be preferred in settings where mobile money uptake is lower.

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1 Introduction

Many countries expanded social programs in response to the Covid-19 pandemic. For example, 186 countries introduced or expanded cash transfer programs, which are utility-maximizing in theory and have been shown to produce positive impacts (Egger et al. 2021; Banerjee et al. 2020). But nearly the same number of countries, 181 in total, responded to Covid-19 with programs to lower or postpone payments for utilities, such as electricity, water, transport, and mobile money transactions (Gentilini et al. 2021a). In-kind transfers may be preferable over cash if they circumvent savings constraints or reduce transaction costs, especially when transfers are infra-marginal, but they may also be chosen for non-economic reasons, like private interests, political economy considerations, and paternalism (Southworth 1945; Bruce and Waldman 1991; Currie and Gahvari 2008; Cunha 2014; Gadenne et al. 2021; Hirvonen and Hoddinott 2021). This paper asks: during times of crisis, do people in developing countries prefer cash or in-kind transfers and why?

Two of the most common forms of government pandemic social protection programs are pre-paid electricity credit and mobile money transfers. To compare demand for mobile money (equivalent to cash where mobile money is accepted) and pre-paid electricity credit, we survey more than 2,000 adults across two comparable contexts in Africa: urban Ghana and urban Kenya. We find a large and significant gap in preferences between these two settings. In urban Kenya, 95% of respondents in an incentivized experiment prefer mobile money, and many are willing to forego significant value to receive mobile money rather than an electricity transfer. In Accra, the capital of Ghana, just 50% prefer mobile money over pre-paid electricity of the same value in a hypothetical scenario, and many would forego significant value to receive electricity. Socioeconomic and survey characteristics contribute to this gap, but a large difference persists even when controlling for these.

We argue that a leading explanation for differences in preferences is the difference in mobile money infrastructure between Kenya and Ghana. In Kenya, 97% of households have at least one mobile money account, 75% of adults regularly use mobile money, and mobile money is almost universally accepted for commercial transactions (Suri et al. 2021). In contrast, only 39% of adults in Ghana have a mobile money account (Bank of Ghana 2019). Cash transfers disbursed as mobile money can thus be used more flexibly in Kenya than in Ghana. Moreover, the 2009 integration of the payment system of Kenya Power (Kenya's utility) with Safaricom significantly lowered the transaction costs of buying electricity (Safaricom 2019). In Ghana most consumers must physically visit a vendor to purchase electricity credit. The time and effort required to buy electricity increases demand for electricity transfers, as these allow recipients to circumvent these costs.

Outside of this difference in mobile money penetration, urban Kenya and Ghana appear comparable. The World Bank (2019) estimates that 94% and 91% of urban residents in Ghana and Kenya have access to electricity; 98% and 99% progress to secondary school; and there are 1.3 and 1.0 mobile cellular subscriptions per capita, respectively. Furthermore, 92% and 94% of households in urban Ghana and Kenya own a mobile phone; 73% and 74% own a radio; 17% and 16% own a bicycle; and 7% and 6% own a motorcycle (DHS Kenya 2015, DHS Ghana 2015).

We examine other contextual differences that might also contribute to these results. First, re-

spondents in Accra, Ghana report five times greater monthly electricity spending than urban Kenyan respondents. However, the gap in preferences across contexts is similar even among respondents with similar electricity consumption, and electricity spending does not affect preference for electricity over mobile money. Second, while there is a small difference in electricity tariffs between Ghana and Kenya, the electricity transfers are calibrated to the cash transfer amount, so it is unlikely that this would drive preference for electricity. Third, since Ghana's government implemented a pandemic electricity relief program at the time we surveyed Ghanaian respondents, one might expect these to have trusted the implementation of a hypothetical electricity transfer more than a mobile money transfer. However, few Ghanaian respondents gave lack of trust as a reason for their choice, and previously receiving a government electricity transfer does not appear to be a significant factor in respondents' preference for electricity versus mobile money.

Finally, in Ghana, the preference elicitation for all respondents was hypothetical, while in Kenya part of the sample were randomly offered an incentivized choice. While this affected responses, it cannot fully account for the large difference. The gap in preferences between persists even when controlling for this difference in survey design. Preferences amongst a separate sample of 2,228 adults enrolled in rural Kenya reveals a slightly higher preference for electricity transfers when the decision is incentivized, consistent with higher transaction costs for purchasing electricity tokens and lower mobile money penetration in rural areas.

One concern for policy might be that mobile money and electricity transfers have different welfare impacts that are not reflected in preferences. To assess this, we study the impacts of mobile money and electricity transfers using experimental variation in Kenya and quasi-random variation in Ghana. Pre-paid electricity transfers increase electricity consumption while cash transfers do not. We find no impacts of electricity transfers on any other socioeconomic outcomes, though it is worth emphasizing that transfer sizes are small here.

The large disparity in mobile money infrastructure between Ghana and Kenya appears to account for much of the gap in preferences. Consequently, financial infrastructure should be more centrally considered in public economics debates on the optimal form of government aid, such as the choice between cash versus in-kind transfers. The GSM Association (2021) reports that, during the Covid-19 pandemic, "many governments and NGOs turned to mobile money providers to distribute income support and emergency payments rapidly and efficiently." The same report also recognizes the potential expediency of subsidizing electricity costs: "as of 2020, digital utility payments were available in 75 per cent of all countries worldwide, and as such utility payments can function as an additional bridge to increased financial inclusion." The rapid spread of mobile money and the digitization of utility infrastructure can help governments disburse transfers more quickly, cheaply, and securely. However, this expediency has not yet translated to changes in policy recommendations. In a recent World Bank report, Gentilini et al. (2021b) provide a detailed analysis of cash transfers in urban Africa, but they omit the role electric utilities can play in improving expediency and reach. The relative benefits of cash and electricity transfers will also depend on policy objectives: if the key goal is expediency, for example, then electricity transfers might be preferred in contexts where

governments do not have existing mobile money relationships with citizens.

2 Background

In 2007, Safaricom launched one of the first mobile money products in the world: M-PESA. Today, 97% of Kenyan households have at least one M-PESA account, 75% of adults use mobile money at least somewhat regularly, and 68% of households live within 1 km of an M-PESA agent (Suri et al. 2021). However, adoption is not as widespread elsewhere in Africa. In Ghana, only 39% of adults use mobile money (World Bank 2019). The usage gap is even starker: in the past 90 days only 32% of Ghanaian mobile money accounts had transacted, whereas in Kenya more than 85% of mobile money account owners had used their accounts (BoG 2019, CBK 2019).

As mobile money integrates with a country's economy, its value can increase significantly. In 2009, Safaricom partnered with Kenya Power to let utility customers pay their electricity bills using mobile money. Most respondents in our Kenya sample can use this service. In 2010, they launched *Nunua na MPESA* ('Buy with MPESA'), enabling mobile money transactions at supermarkets (Safaricom 2019). The 2013 launch of Lipa-na-MPESA ('Pay-with-MPESA') further facilitated the nationwide use of mobile money for commercial transactions in Kenya.

In Ghana, these integrations have been slower to take place. The majority of households in Accra are connected to pre-paid meters, meaning that they may only consume electricity paid for in advance by purchasing electricity credit. 93% of pre-paid customers in our sample have to travel to an ECG office or official electricity vendor to purchase credit—only 7% have a 'smart' pre-paid meter that allows mobile top-up. Receiving electricity credit thus helps avoid the time and cost of travelling to an electricity vendor to purchase credit. Among adults who pay utility bills, 82% in Kenya had used mobile money to do so while only 23% in Ghana had (World Bank 2018).

The urban samples included in our analyses are all connected to pre-paid meters, and pay for electricity by purchasing credits. Kenya and Ghana both use an increasing block tariff structure, with the lowest unit costs offered to the lowest consumers. This 'lifeline' threshold is 32 kWh per month in Kenya and 50 kWh per month in Ghana, which are roughly equivalent to operating four light bulbs, a television, a cell phone charger, and perhaps an iron under average usage patterns.

Comparing urban Ghana and Kenya is useful because households are broadly similar along many socioeconomic characteristics (Table 1). Households in Ghana are slightly more likely to be connected to electricity, but this gap has closed recently: by 2019, 94% and 91% of urban households in Ghana and Kenya, respectively, had access to electricity (World Bank 2019). Most other variables—including radio ownership, mobile phone ownership, bicycle and motorcycle ownership, household size, and education—are also very similar across urban Ghana and urban Kenya.

2.1 Covid-19 policy responses

Kenya and Ghana both confirmed their first Covid-19 positive patient on March 12, 2020. Three days later, Kenya's President Uhuru Kenyatta and Ghana's President Nana Addo Dankwa Akufo-

Table 1: Comparison between sample contexts

	Urban Ghana	Urban Kenya
Electricity connection	90.8%	68.4%
Has a radio	72.5%	73.5%
Has a television	77.7%	56.0%
Has a mobile phone	92.3%	94.2%
Has a refrigerator	50.5%	12.7%
Has a bicycle	17.4%	16.2%
Has a motorcycle	6.9%	6.0%
Household size	3.1	3.2
Years of education, women	6.5	7.4
Years of education, men	8.2	7.7

Statistics are means from nationally-representative household samples taken from the reports for the 2014 Demographic and Health Surveys in Ghana (USAID 2015a) and Kenya (USAID 2015b).

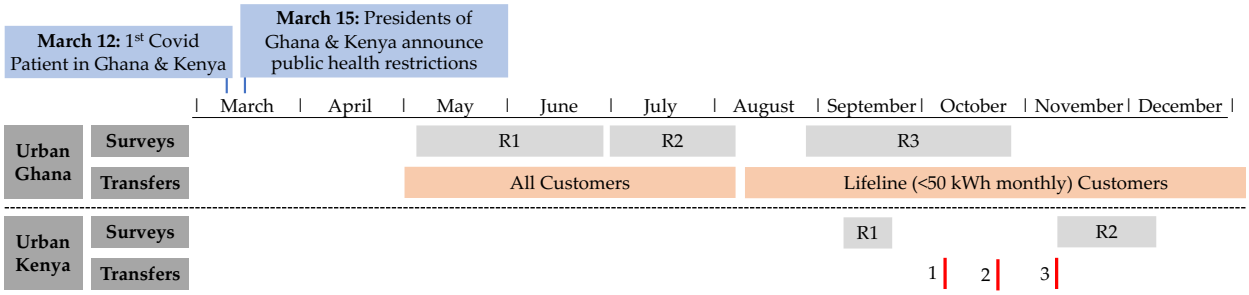
Addo both announced a broad set of physical distancing measures which eventually included bans on social gatherings in crowded places, closures of schools, universities, and congregations in places of worship, and significant travel restrictions both domestically and internationally. The economic impacts of the Covid-19 public health crisis and its accompanying policies were substantial. Egger et al. (2021) find that "*50% to 80% of sample populations in [Ghana and Kenya] report income losses during the COVID-19 period.*" Firm profits and revenues in Kenya fell by 51 and 44% respectively.

Most governments worldwide introduced or expanded cash transfer programs to help alleviate Covid-19 related economic downturns. In many African countries mobile money was an important tool for providing cash transfers, particularly for populations excluded from formal financial institutions. At the same time, many countries implemented in-kind transfer programs. These can be attractive to governments lacking infrastructure to distribute cash broadly.

In March 2020 the Government of Kenya expanded its existing social safety net, *Inua Jamii*, which provides mobile money transfers to society's most vulnerable populations—including the elderly, orphaned children, survivors of sexual violence, people with disabilities, and pregnant mothers—and launched urban public works employment schemes (Gentilini et al. 2021a).

The government of Ghana launched an electricity relief program in May 2020, citing the importance of reliable electricity during economic downturns. All households with an electricity connection were eligible to receive a monthly transfer, with amounts pinned to March 2020 consumption (ECG 2020). Customers who consumed less than Ghana's 'lifeline' amount of 50 kWh in March were eligible to receive 50 kWh in electricity credit—worth USD 3.50—each month. All other customers would receive 50% of their March consumption. In theory, all electricity customers were eligible for transfers from May to July 2020, and eligibility for lifeline customers—around 10% of our sample—continued until March 2021. In practice not all households received transfers, and there was significant heterogeneity in the timing and consistency of monthly transfer receipt. Berkouwer et al. (2022) find significant regressivity in both the design and the implementation of Ghana's electricity program, and find that the program increased government support among recipients. The

Figure 1: Timeline



Timeline of 2020 study components. Orange boxes represent phases of government electricity transfers in Ghana. Vertical red lines represent experimental cash or electricity transfers in Kenya.

government of Ghana also implemented limited food and water relief programs, and provided an additional round of cash transfers to existing recipients of the Livelihood Empowerment Against Poverty (LEAP) Program, which targets around 5% of Ghana's poorest households with similar vulnerability criteria as Kenya's *Inua Jamii* (Dadzie and Raju 2020).

Other than the programs described above, government pandemic aid was limited. In both Kenya and Ghana, fewer than 10% of respondents reported receiving any cash, food, or other aid from the government or an NGO in the past 1-2 weeks.

3 Study Design

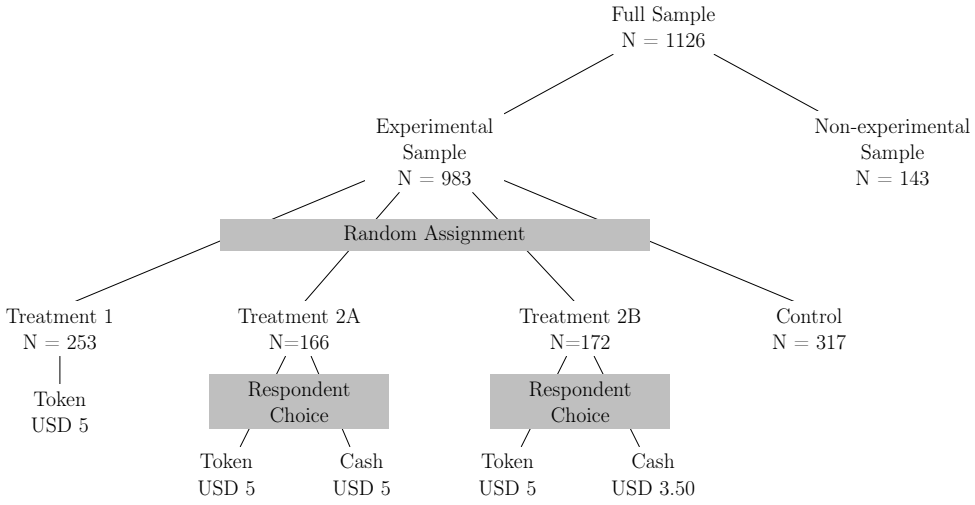
Between May–November 2020, the research team surveyed 4,265 respondents by phone, between one and three times each. The primary sample consists of 911 adults in urban Ghana and 1,126 adults in urban Kenya. We also survey 2,228 respondents in rural Kenya. Figure 1 displays a timeline. All respondents completed between one and three phone surveys between May and November 2020.

In Kenya, 1,248 respondents were asked about their WTP for electricity versus mobile money transfers, including 295 who were asked in an incentivized manner.[1] 2,053 respondents—983 urban and 1,070 rural—were enrolled in a randomized field experiment and randomly assigned to one of four groups: a control group, a group that received pre-paid electricity tokens, and two groups that were given an incentivized choice between mobile money or electricity transfers at different rates. 349 were assigned to an incentivized choice between mobile money and electricity transfers at a 1:1 rate (Figure 2 displays the treatment assignments and sample sizes; Section 3.1 provides more detail). The 1,126 respondents located in urban Kenya (983 in the experimental sample, and an additional 143 in a non-experimental sample) were recruited through a mobile survey firm and are located in Nairobi (39%), Eldoret (11%), Mombasa (9%), and other urban areas. Finally, the 2,228 respondents located in rural Kenya were located in Western Kenya, Nyanza, and Rift Valley and had previously participated in Lee et al. (2020) or Wolfram et al. (2021).

In Ghana, all 911 respondents were eligible for electricity transfers through the government's

[1] 1,092 were asked for their hypothetical WTP and 295 were asked an incentivized question as part of an experiment. These numbers include 139 individuals who were asked both.

Figure 2: Experimental design and sample sizes in urban Kenya



Participants in Treatment 1 (T1) received three transfers of pre-paid electricity tokens worth USD 5 each. Participants in T2A (T2B) were given a choice between USD 5 worth of electricity tokens or USD 5 (USD 3.50) in mobile money. Whichever option they chose, they received each USD 5 transfer three times within a two month period. Participants in the Control group are surveyed but did not receive any transfers. All respondents are connected to electricity via pre-paid meters. The experimental set-up for the rural sample is similar (Figure A1).

Covid-19 relief program for at least three months in 2020. More than two-thirds had received at least one electricity transfer in the first three months of the program. All respondents completed a stated preference survey on electricity versus mobile money transfers. Respondents had been enrolled in 2018 and 2019 as part of Klugman et al. (2019) and are distributed across western Accra.

The urban Ghana and Kenya samples are broadly similar to other households in the study areas based on observable characteristics from nationally-representative surveys (Table A1 and Table A2).

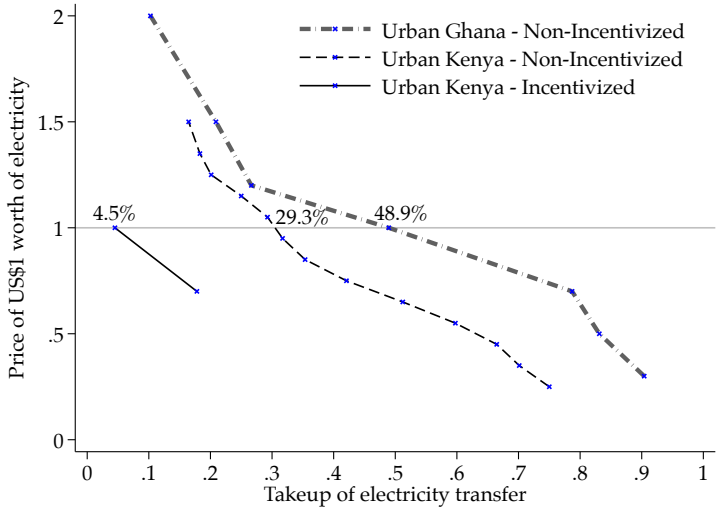
3.1 Electricity transfer WTP elicitation

We elicit WTP for electricity credit using both contingent valuation and an experimental design. In the contingent valuation approach, respondents were presented with a sequence of hypothetical dichotomous choices in each survey round. Respondents in Ghana (Kenya) were first asked to choose between a GHS 50 (KES 500) electricity transfer and a cash transfer of the same amount; the cash amount of each subsequent choice depended on the previous response. WTP is the highest cash transfer amount the respondent rejected in favor of the electricity transfer, up to a maximum of GHS 100 (KES 1,000) and a minimum of GHS 15 (KES 150).[2] GHS 50 and KES 500 are worth approximately USD 8.60 and USD 5, respectively.

In Ghana, we elicit WTP in the context of the government's pandemic electricity relief program. The hypothetical offer of USD 8.60 in electricity credit is close to the median monthly transfer expected in our sample. This amount is equivalent to 85 kWh using local electricity tariffs, and represents 15 days of average electricity spending.

[2]This approach is commonly used to elicit WTP (Alberini and Cooper 2000), including for electricity in different African countries (Abdullah and Jeanty 2011; Deutschmann et al. 2021; Sievert and Steinbuks 2020).

Figure 3: Demand for Electricity Transfers by Context and Incentivization



Demand for USD 1 of electricity expressed in USD of mobile money. The horizontal line represents the point where USD 1 of electricity costs USD 1 in mobile money. The numbers shown indicate the share of respondents who prefer electricity to mobile money in an equal trade-off, by context. The solid line indicates incentivized elicitation. Dashed lines indicate non-incentivized elicitation over hypothetical tradeoffs.

In Kenya, in addition to the hypothetical WTP elicitation, we leverage choices made as part of a randomized controlled trial that involved 2,053 respondents (983 urban and 1,070 rural). Those in the treatment groups received three monthly transfers in between the first and third surveys. One-sixth—349 respondents—were given a choice between transfers of USD 5 in electricity tokens or USD 5 in mobile money ('T2A'): we can thus compare their responses with the non-incentivized sample. Randomization for the urban sample is done at the individual level. For 70% of respondents, the USD 5 transfer bought around 32 kWh in pre-paid electricity.[3] This represents 50 days of average electricity spending for urban respondents. All experimental transfers were transmitted remotely. Cash was transferred using Safaricom's M-Pesa mobile banking service to a mobile money account tied to a phone number provided by the respondent. Electricity tokens were purchased at a local Kenya Power office, and then the token ID was sent by SMS to respondents, who could then enter it into their meter to activate the credit.[4]

4 Results: Preferences for electricity and mobile money

Figure 3 presents electricity take-up at different implicit prices (the ratio of the mobile money offer to the electricity transfer offer). Our primary analysis compares urban households in Ghana and

[3]Kenya Power's tariff changes slightly month-to-month. In addition, those connected through the government's Last Mile Connectivity Project (LMCP)—including most respondents from Wolfram et al. (2021) and those not connected through Lee et al. (2020)—were paying monthly installments for their connections. In these cases, part of each top-up is applied to debt repayment before being used to buy kWh of electricity. 15% received around 22kWh, 7% received around 16kWh, and the rest received between 10 and 30 kWh per transfer. Respondents connected through Lee et al. (2020) did not have debt outstanding and generally received around 32 kWh.

[4]To prevent fraud, each token is tied to a respondent's Kenya Power account number.

Table 2: Preference for electricity over cash

	(1)	(2)	(3)	(4)
Kenya (=1)	-0.24***	-0.22***	-0.20***	-0.13**
	(0.02)	(0.02)	(0.02)	(0.05)
Electricity expenditure in the past week (USD 10s)		0.03	0.03	0.03
		(0.02)	(0.02)	(0.02)
Incentivized (=1)			-0.23***	-0.29***
			(0.02)	(0.05)
Rural (=1)				-0.07
				(0.05)
Observations	4155	4155	4155	4155
Control Mean	0.49	0.49	0.49	0.49

The outcome variable is the fraction of respondents who choose electricity when given a choice between a cash transfer and an electricity transfer of equal value. Standard errors clustered by household in parentheses.

Kenya who faced a non-incentivized decision. In Kenya, at an implicit price of USD 1, 71% of respondents prefer mobile money, and respondents are willing to forego on average 40% of value to receive mobile money instead of an electricity transfer. By contrast, in Ghana, at an implicit price of USD 1 almost half of respondents choose electricity, and respondents are on average willing to forego 4% of value to receive an electricity transfer instead of mobile money.

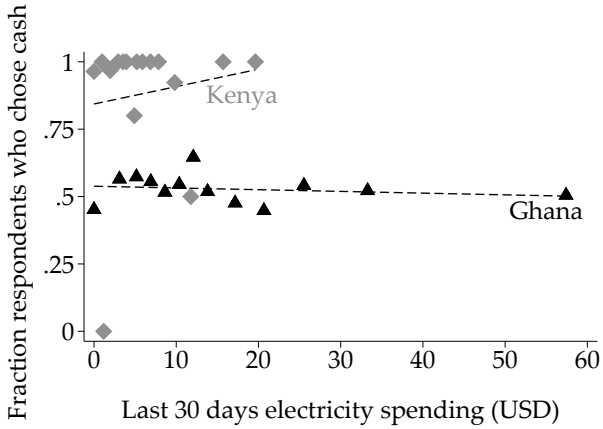
The preference for mobile money increases substantially when the decision is incentivized. In Kenya, just 5% of urban participants take up the electricity transfer in an equal trade-off. Even when USD 1 of electricity has an implicit price of only USD 0.70 in mobile money, only 18% select electricity. Table 2 confirms that there remains a sizable and significant difference in preferences between Kenya and Ghana after controlling for whether elicitation was incentivized.

What might explain this gap in preferences? We identify three contextual differences between Ghana and Kenya that might drive the preferences gap. First, electricity spending is higher in Ghana[5]. Urban households in Ghana are more likely to own large appliances than those in Kenya, and monthly electricity spending is five times as high in Accra, Ghana as in urban Kenya, at USD 15 and USD 3.20 per month, respectively (Tables 1, A1, and A2, provide more detail). To examine whether Ghanaians prefer electricity to cash simply because they spend more on electricity, Figure 4 shows the correlation between preference for mobile money and monthly electricity expenditures for each country. Preferences are relatively constant regardless of electricity expenditure, and, crucially, the difference between Kenya and Ghana holds even when comparing respondents with relatively similar electricity expenditures.[6] Columns (2) and (3) of Table 2 also confirm that there is no correlation between electricity spending and preference. These differences are therefore unlikely to drive the large gap.

[5]There is a small difference in electricity tariffs between Ghana and Kenya, but the electricity transfers are calibrated to the cash transfer amount so it is unlikely that this would drive preference for electricity.

[6]Household spending on electricity, food, or more generally are not significantly associated with transfer preferences in either Ghana or Kenya (Table A3).

Figure 4: Correlation between transfer mode preference and electricity expenditures by country



The share of respondents choosing cash (disbursed via mobile money) over the same amount of electricity credit at different levels of electricity spending, along with a line of best fit, by country. Across levels of monthly electricity spending, demand for cash relative to electricity is almost twice as high in Kenya as in Ghana. Among this sample, 30 day electricity spending for the median respondent in Kenya (Ghana) is USD 2.94 (USD 10.38) such that a USD 5 electricity transfer would last approximately 7.4 (2.1) weeks.

Second, respondents in Ghana might have trusted the implementation of a hypothetical electricity transfer more than a mobile money transfer given their past experience with Ghana's pandemic electricity relief program. However, it does not appear that this is an important channel. Just 6% of those who preferred electricity cited a lack of trust that they would actually receive the mobile money transfer as a reason. Respondents who received at least one government electricity transfer are slightly more likely to opt for electricity, but this difference is less than 5% and only marginally significant at the 10% significance level (Figure A2).

We argue that a third contextual difference, in mobile money infrastructure, likely explains most of the gap in preferences for electricity versus mobile money transfers between Ghana and Kenya. Kenya has a well-developed and widely adopted mobile money system in M-PESA, making mobile money transfers much more attractive than electricity transfers; by contrast, Ghana lags in mobile money adoption, making electricity transfers preferable. In Kenya, 97% of households regularly use a mobile money account (Suri et al. 2021), compared to 39% in Ghana (Bank of Ghana 2019). In Ghana, mobile money has high transaction fees—10% of respondents in Ghana state that they "worry about mobile money charges/costs"—and is not widely accepted by merchants, decreasing its value. By contrast, in Kenya, mobile money can purchase a broad set of goods and services. Differences in mobile money infrastructure also affect transaction costs of electricity purchases. In Ghana, 21% of respondents who preferred electricity state that it "takes too much time/effort to top up," while in Kenya only 10% of respondents report the same. Most Kenyan households can use mobile money to purchase electricity credits through Lipa-na-MPESA, while Ghanaian households must go to an official vendor. Finally, the incentivized preference for cash is slightly lower among rural Kenyan respondents (Figure A3). This would make sense given that Lipa-na-MPESA penetration is lower in rural Kenya, lowering the value of mobile money and its increasing transaction costs.

In addition to contextual factors, differences at the individual level can explain some of the variation in preferences. Ownership of electric appliances—of a refrigerator in particular for Kenyan households—is positively associated with a preference for electricity over mobile money in both Ghana and Kenya (Table A3).

Individuals with sophisticated present-biased consumption preferences may opt to constrain themselves by allocating more resources to electricity credit: pre-paid electricity generally does not expire and can thus be a useful savings device. Among respondents who preferred electricity, 36% in Ghana and 73% in Kenya state that they worry they "will spend the money on something else." At the same time, households facing tighter short-term liquidity constraints—as during an economic crisis—may prefer mobile money. Since electricity credit cannot generally be converted back to cash, large electricity transfers could take weeks to consume whereas cash may provide these households with much-needed short-term liquidity. Individuals who prefer electricity to cash appear to be those who do not face major liquidity constraints: 62% of respondents in Ghana and 46% of those in Kenya who prefer electricity state that they "would use the money for electricity anyway." For these households, electricity is the marginal expenditure.

5 Results: Impact of transfers

One concern for policy makers choosing between mobile money and electricity transfers may be that these have different welfare impacts that are not reflected in preferences. We therefore estimate the impacts of electricity transfers, and in Kenya compare these against the impacts of mobile money transfers for individuals who chose mobile money transfers over electricity transfers. In Kenya we use the randomized treatments to establish causality. In Ghana we leverage quasi-randomness in government transfer roll-out. In both settings, transfer amounts are relatively small, and we generally estimate minimal impacts.

The following equation estimates the effects of each randomly assigned treatment for the Kenya experimental sample:

$$y_{si} = \beta_0 + \beta_1 T^1_{si} + \beta_2 T^{2A}_{si} + \beta_3 T^{2B}_{si} + X_{si}\Gamma + \varepsilon_{si} \tag{1}$$

where y_{si} is the outcome of interest for respondent i at village s, $T^1_{si} = 1$ if the respondent is assigned to the direct electricity transfer arm (T1), $T^{2A}_{si} = 1$ for the USD 5 electricity / USD 5 cash arm (T2A), $T^{2B}_{si} = 1$ for the USD 5 electricity / USD 3.50 cash arm (T2B), and X_{si} is a vector of controls, pre-specified in Berkouwer et al. (2020). ε_{si} are clustered by village for the rural sample but allowed to vary by individual for the urban sample. Table 3 estimates equation 1 for the urban sample.[7] Panel B estimates equation 1 for the rural sample, pooling survey rounds 2 and 3 to increase statistical power. The 'Token Treatment' column gives the effects of an electricity transfer

[7] As a newly collected sample recruited over SMS, the urban data lack the same detailed set of outcomes as for the REPP and LMCP samples, so the regressions instead include indicator variables for each of the eight Living Standard Measure (LSM) scores as controls.

Table 3: Impact of transfers on energy and other consumption, urban Kenya

	N	Control Mean (SD)	Token Treatment (SE)	500 Ksh vs Tokens (SE)	350 Ksh vs Tokens (SE)
Electricity usage since baseline (kWh)	651	40.88	42.73***	3.21	9.89*
		(40.06)	(4.32)	(4.10)	(5.20)
Electricity usage since baseline (approx value in USD)	651	3.74	3.91***	0.29	0.91*
		(3.67)	(0.40)	(0.38)	(0.48)
Prepaid electricity expenditure in the past 2 weeks in USD	897	1.39	-0.58***	0.26	0.17
		(1.92)	(0.14)	(0.18)	(0.18)
Meter balance (kWh)	690	10.03	15.48***	-1.43	3.96**
		(13.86)	(1.69)	(1.20)	(1.84)
Energy spending in the past 7 days in USD (excl. electricity)	894	0.72	0.17	0.10	0.12
		(1.66)	(0.14)	(0.17)	(0.16)
Energy spending in the past 7 days in USD (excl. electricity and charcoal)	891	0.17	-0.03	0.05	-0.01
		(0.54)	(0.04)	(0.06)	(0.04)
Non-energy spending in the past 7 days in USD	887	32.89	-1.09	-3.00	-0.69
		(25.66)	(2.01)	(2.38)	(2.39)
Dissaving (pc) in the past 14 days in USD	908	7.17	2.09	3.51	-0.06
		(38.69)	(2.73)	(5.73)	(2.60)
Total consumption in the past 7 days in USD	887	34.32	-0.94	-2.51	-0.30
		(26.35)	(2.08)	(2.46)	(2.44)

Estimates of Equation 1 for urban Kenya. Regressions include baseline controls for sex, education, banking status, and housing quality (from Lee et al. (2020) or Wolfram et al. (2021)); and the Covid-19 survey baseline value for each outcome. FDR q-values for all coefficients are statistically insignificant at $\alpha = 0.10$, except for electricity usage for T1 (FDR q-value = 0.00). Electricity usage since baseline (kWh) is the sum of (1) the difference between baseline and endline meter balance, (2) household top-ups since baseline, (3) kWh received through treatment (if any). Table A4 presents the corresponding outcomes for rural Kenya.

while the '500 Ksh vs Tokens' column can be interpreted as impacts of a cash transfer, given that most respondents opted for mobile money when given this choice.

In Ghana we leverage quasi-random variation in respondent receipt of the government's pandemic electricity relief program to estimate the impacts (Berkouwer et al. 2022). The program officially launched in early May but the distribution of government transfers was staggered. By late May, around half of survey respondents had received at least one transfer, and at the end of October around 70% had received at least one transfer. Household fixed effects allow us to average out any cross-household heterogeneity or selection and leverage the fact that we surveyed households multiple times over three separate survey rounds. We argue that the timing of transfer receipt within households is exogenous, and that the following household fixed effects specification allows us to isolate the impact of government transfer receipt on socioeconomic outcomes:

$$y_{it} = \beta_0 + \beta_1 T_{it}^{30} + \beta_2 T_{it}^{pre-30} + \mu_i + \tau_t + \varepsilon_{it} \tag{2}$$

where y_{it} is the outcome of interest for respondent i at time t, $T_{it}^{30} = 1$ if the respondent received government relief in the last 30 days, $T_{it}^{pre-30} = 1$ if the respondent previously received government relief but not in the last 30 days, μ_i is a household fixed effect, and τ_t is a week of year fixed effect. Standard errors are clustered at the household level. The coefficient on $T_{it}^{30} = 1$ can be

Table 4: Government relief and energy and other consumption, urban Ghana

	N	Control Mean (SD)	Relief in last 30 days (SE)	Relief before last 30 days (SE)
Electricity spending in past month (USD)	2312	15.20	-1.49*	-1.32
		(13.49)	(0.83)	(0.98)
Current balance on prepaid meter (USD)	759	5.05	0.23	0.01
		(7.01)	(0.88)	(1.15)
Pre-paid topups in last 30 days	2000	1.90	-0.19*	-0.10
		(1.40)	(0.11)	(0.13)
Average topup amount in last 30 days (USD)	2004	10.21	-0.13	-0.41
		(9.56)	(0.57)	(0.71)
Total consumption in the past 7 days (USD)	2349	113.27	0.18	-0.63
		(110.53)	(6.92)	(8.41)
Energy spending (excl. electricity) in the past 7 days (USD)	2325	4.39	0.09	0.13
		(6.37)	(0.52)	(0.58)
Food spending in the past 7 days (USD)	2329	32.63	0.44	1.82
		(25.97)	(1.69)	(1.84)
Worried about having enough food in past 7 days (=1)	2350	0.22	-0.04	-0.04
		(0.41)	(0.03)	(0.03)
Number of days in past 7 that adults skipped meals	2348	0.86	-0.13	0.02
		(1.88)	(0.12)	(0.13)

Estimates of Equation 2 for energy and consumption outcomes in urban Ghana. From left to right, the columns show the number of observations, the control mean, and the effects of receiving government electricity relief in the last 30 days and of previously receiving relief but not in the last 30 days (relative to never receiving relief). Timing of transfer receipt is not randomly assigned, so these estimates should be interpreted as suggestive correlations. Regressions include household and week fixed effects, and we cluster SEs at the household level. FDR q-values for all coefficients are statistically insignificant at the $\alpha = 0.10$ level.

interpreted as the effect of receiving relief relative to never receiving any government electricity transfers. Transfer receipt in this sample is plausibly quasi-random: we do not find any evidence that baseline socioeconomic characteristics predict receipt, and by including household fixed effects we rule out inter-household selection bias. However, since the timing of transfer receipt is not randomly assigned, these results should be interpreted as suggestive. Table 4 presents the results.

While we use different methods for estimating impacts, we find limited impacts of the transfers on socioeconomic outcomes in Kenya and Ghana. Electricity transfers increased electricity usage despite decreased electricity spending in both contexts, which suggests electricity transfers also free up some resources for other uses. The frequency of electricity top-ups also falls in Ghana, indicating lower transaction costs for transfer recipients. Households in rural Kenya that receive electricity transfers significantly increase their total spending in the last 7 days.

In Kenya, electricity transfers increased electricity usage by 29 kWh (worth roughly USD 3) for the rural sample and 43 kWh for the urban sample. These effects are large: relative to the control group, treated households increased electricity usage by 62% in the rural sample and 105% in the urban sample. Transfers also led to higher electricity meter balances at endline for both groups, and to decreases in recent electricity spending. Recipients thus appear to be storing some portion of their transfers, in addition to increasing their consumption.

On the other hand, the T2A treatment arm had no effect on electricity usage among urban

respondents—95% of whom chose mobile money. Given that electricity is storable and transaction costs for using mobile money to purchase electricity tokens are low, there is no reason *ex ante* for the electricity transfers in T1 to generate larger increases in electricity usage. Instead, mental accounting, or increased attention to electricity usage due to the treatment, might account for increased electricity consumption among T1. The T2B treatment arm—when the offered mobile money amount is less than the offered electricity transfer—does increase electricity usage, consistent with more respondents choosing electricity in this treatment.

In Ghana, electricity expenditure falls by USD 1.50 in the last 30 days for respondents that received electricity relief in that time period. This is driven by less frequent topping up of electricity credit; average top-up size does not fall. Electricity transfers thus allow households to avoid transaction costs associated with topping up electricity. Pre-paid meter balance at the time of the survey increases, but unlike in Kenya this is not significant—households appear to be largely consuming rather than storing their transfers. This indicates that monthly relief transfers were generally inframarginal to optimal monthly household electricity consumption, which accords with the transfer program design. The reduction in monthly expenditure is less than the mean amount received in the last 30 days among recipients (10 USD). Together with the non-significant increase in meter balance, this suggests recipients increase electricity consumption relative to non-recipients, with over 75% of the transfer going to increased consumption.

Other than electricity use, electricity transfers had minimal impacts on other outcomes such as non-energy spending and food security (Table A5).

In Kenya, we also analyze the treatment impacts when respondents chose between electricity and cash. Since most chose cash, impacts of those treatments can be interpreted as closer to the impact of cash transfers. While the electricity transfer has a significant impact on electricity usage but no other outcomes, the cash transfers have no to little impact on any of the measured outcomes. Given the existing literature finding large positive effects of cash transfers (Haushofer and Shapiro 2016; Handa et al. 2018), the lack of detectable impacts may be the result of limited statistical power, especially considering the modest transfer size. We therefore interpret these results cautiously.

6 Conclusion

During times of crisis, do people prefer cash transfers or in-kind transfers like electricity subsidies? We run preference elicitation surveys in urban Kenya and Ghana where respondents choose between electricity credit and a varying amount of mobile money. These two contexts—urban settings in Sub-Saharan Africa with high rates of electricity connectivity, cell phone ownership, and education—are comparable along most observable characteristics, yet we find strikingly different results. In urban Kenya, 95% of respondents prefer mobile money to the same amount in electricity credit, with most choosing cash even when offered prepaid electricity tokens worth 40% more. In urban Ghana, on the other hand, nearly half of respondents prefer electricity, and many respondents are willing to forego significant value to receive electricity rather than mobile money.

These differences likely stem from Kenya's advances in mobile money infrastructure. Mobile money is almost ubiquitous in Kenya and is well-integrated with Kenya Power's payment system, increasing its value and reducing the transaction costs of buying electricity. In contrast, in Ghana mobile money is less common, limiting its value, and direct electricity transfers allow recipients to avoid the transaction costs associated with buying prepaid electricity credit.

For governments, mobile money infrastructure provides a channel to transfer funds cheaply and quickly. It may also alleviate financial pressures that electricity subsidies impose on utilities. In theory the mode of transfer should not affect the fiscal source of funding, but in practice, the cost of electricity transfers is often borne by utilities, whereas cash transfer programs are often paid for by other government agencies. This is an important concern. Electric utilities in 37 out of 39 Sub-Saharan African countries are currently operating at a cost that exceeds the revenue recovered through existing tariffs (Kojima and Trimble 2016). In contexts where utilities are majority government-owned, they may receive a mandate of providing subsidized electricity without financial compensation for the additional cost this would incur. This added social responsibility may increase financial strain on a utility's ability to provide reliable electricity. Fiscal and financial responsibilities will vary by context and may also affect optimal policy.

Together, these results demonstrate that financial infrastructure may affect the efficiency of government aid disbursement, citizen preferences, and as a result, a social planner's optimal policy choice. In contexts with rapid mobile money adoption, cash transfers will likely become a cheaper and more effective channel of disbursing government aid, as shown by the expansion of social assistance in some African settings during the pandemic (Gentilini et al. 2021a; GSM Association 2021). However, in contexts with limited mobile money adoption but a more developed utility infrastructure, in-kind transfers may continue to be preferred. Governments responding to economic crises, including the ongoing COVID-19 pandemic, should adapt policies to reflect the level of mobile money adoption and its integration with payment systems.

The results suggest that the optimal form of government transfers (mobile money or electricity credits) depends on a country's financial transactions infrastructure. However, that landscape is rapidly changing. While mobile money is still less widely used in Ghana than in Kenya, Ghanaians are rapidly adopting mobile money. Between December 2017 and December 2018 the number of active mobile money accounts increased by 17%—from 11 million to 13 million—and the number of mobile money agents more than doubled—from 195,000 to almost 400,000 (Bank of Ghana 2019). If Ghana reaches the high levels of mobile money adoption seen in Kenya, household preferences for electricity versus mobile money may shift, and make mobile money transfers a more desirable way to disburse government aid. The COVID-19 pandemic has accelerated the adoption of mobile money and financial products in many countries (GSM Association 2021), likely hastening this transition.

At the same time, mobile money penetration may remain persistently low in some communities—including those with low financial literacy, those where intended recipients are too poor or lack the technological know-how to own a cellphone, and the ultra-poor, for whom mobile banking fees can be prohibitive. In these contexts, in-kind transfers may remain preferred.

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