

The effect of pre-paid electricity metering on the poor

Evidence from Cape Town



In brief

- Prepaid meters are spreading rapidly in the developing world because they facilitate revenue recovery. A pre-paid meter can be charged using a token with a meter-specific code. Tokens can be purchased from the utility company at points of sale, such as grocery stores.
- The key difference between pre-paid metering and electricity billing is that electricity can be used only after charging up the meter rather than paying for it after use. This makes prepaid meters attractive to utility companies, which often have difficulty enforcing bill payments.
- With the introduction of pre-paid metering, poorer households tend to reduce their overall electricity consumption more and buy smaller amounts of electricity at higher frequency. Many other goods poor households exhibit similar purchasing patterns.
- Preliminary research results from an experiment in Cape Town, South Africa suggest that these observed changes are a function of the financial constraints poor households are under, leading them to spend significant time and effort on electricity purchases (transaction costs).
- When introducing pre-paid metering, it is important to make electricity tokens easily accessible and to minimise the transaction cost of frequent token purchases, especially in poorer areas, to avoid disproportionately burdening poorer households.

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Overview of the research

Along with many municipalities in developing countries, the City of Cape Town, South Africa, began rolling out pre-paid electricity metering in the 1990s. Today, the majority of households have pre-paid meters. A previous evaluation (Jack and Smith, 2019) showed that switching households from monthly billing to pre-paid metering led to two changes in purchasing patterns:

1. Households reduce electricity consumption by, on average, 14%, and poorer households respond more strongly.
2. The household's financial situation affects the frequency and size of electricity transactions: Less well-off households buy electricity more often and in smaller amounts.

The aim of this study (see the [International Growth Centre Project, 2017](#)) is to understand better why households change their consumption patterns in this manner. Households need to spend time and effort (transaction costs) every time they buy an electricity token at a sales point and charge the meter. Why are they incurring these costs so often? The purchasing patterns we observe here are not unique to electricity, so the study sheds light on the larger question of why poor households tend to buy in small amounts and at high frequencies, often paying higher prices as a result.

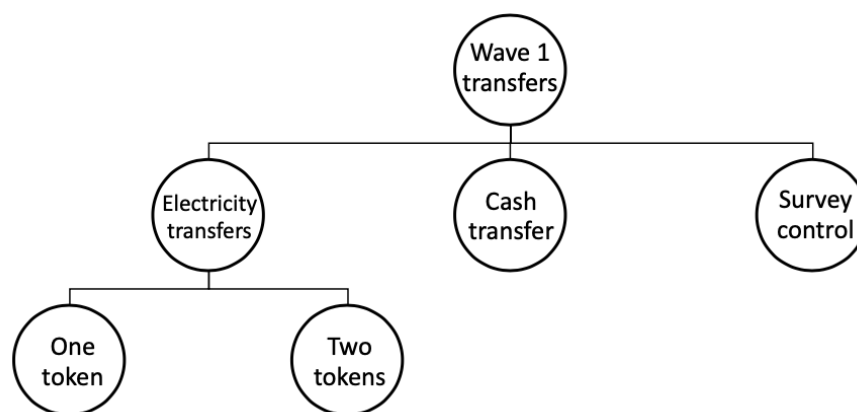
One possible explanation based on economic research suggests that the “temptation” of a fully loaded meter could lead to reduced self-control and cause regret later (such as watching more TV or turning the heat higher). Keeping the meter balance low might improve the household's ability to control its consumption and allow them to use the saved money for other things. Thus, households choose to buy small amounts and use the pre-paid meter to get closer to their preferred level of electricity consumption.

Another possible explanation is that poor households have variable and unpredictable income and expenditures, so they find it difficult to save up larger amounts, and risky to tie up too much cash in the meter. They therefore buy small tokens, even though it incurs frequent transaction costs. However, the transaction cost also keeps them from buying electricity quite as often as they would like. In this case, the effort of purchasing vouchers and the resulting lower consumption of electricity create a burden on households that falls disproportionately on the poor.

The experiment

We conducted an experiment in two waves with around 800 households from low-income neighbourhoods in Cape Town.

Figure 1: Experiment model



In the first wave of the study, we measure how households change their electricity consumption in response to receiving different kinds of transfers: An amount in cash, the same amount as one electricity token, or the amount split into two tokens and received three days apart (see Figure 1). We then return to the same households later and use an experimental procedure to measure their “willingness to pay”, or their valuation expressed in money, for receiving one of these different transfer types.

The findings

While the results are preliminary (see the [Project Data, 2015](#)), at the current stage of analysis, there are two main findings:

1. Households do incur transaction costs when purchasing electricity vouchers and they dislike this cost:

The typical survey respondent preferred to receive an electricity voucher over receiving cash, even though electricity consumption increased slightly when the transfer was in electricity.

2. Smaller transfers do not help households curb electricity use:

Giving half of the transfer as a voucher right away and sending the other half to the respondent’s phone three days later did not reduce electricity use relative to the one-off large transfer. Respondents also had no preference for receiving the two small vouchers over the one large voucher, suggesting they did not find this format useful for controlling their consumption better.

If these findings are verified in further analysis, they suggest that prepaid metering might impose a hidden “tax” on poorer households because they incur relatively higher transaction costs.

More broadly, households under financial constraints might spend considerable time on making frequent, small purchases of all manner of goods, to avoid large expenditures. This suggests another dimension to the detrimental effects of poverty: Not only do the poor get to buy fewer goods, but they also spend much more time and effort making those purchases.

Policy recommendations: Transaction costs versus accessibility and coverage

The key difference between standard utility billing and pre-paid metering is that the electricity can be used only after charging up the meter. In monthly billing, electricity is only paid after use, and often with significant delay. This difference is the main reason why utility companies are interested in introducing prepaid meters.

Revenue recovery is difficult and costly for utility companies, especially in poor areas, where households may struggle to pay their bills and move frequently. Prepaid meters eliminate the need to connect and disconnect meters frequently and avoid the costs and political barriers associated with enforcing payment from poor customers.

Our study does not provide a full welfare analysis of prepaid meters relative to billing, and it captures only one dimension of how new technologies may differentially affect the rich and the poor. However, the observed purchasing patterns do suggest higher transaction costs for poorer households: Households with low meter balances are at risk of running out of electricity at times when a trip to the store is inconvenient or even unsafe. Families who buy ten or more tokens a month might spend significant time and energy on meter management.

When considering the introduction of prepaid metering, policymakers should focus on keeping the transaction costs manageable, especially in poorer areas. This includes safe and accessible salespoints with good local coverage. Possible options might be vending machines or phone ordering options.