

Authors

Isabel Günther
Swiss Federal Institute of Technology (ETH)

Adina Rom
Swiss Federal Institute of Technology (ETH)



Using sensors to measure technology adoption in the social sciences

Empirical social sciences rely heavily on surveys to measure human behavior. Previous studies show that such data are prone to random errors and systematic biases caused by social desirability, recall challenges, and the Hawthorne effect. Moreover, collecting high frequency survey data is often impossible, which is important for outcomes that fluctuate. Innovation in sensor technology might address these challenges. In this study, we use sensors to describe solar light adoption in Kenya and analyze the extent to which survey data are limited by systematic and random error. Sensor data reveal that households used lights for about 4 h per day. Frequent surveyor visits for a random sub-sample increased light use in the short term, but had no long-term effects. Despite large measurement errors in survey

data, self-reported use does not differ from sensor measurements on average and differences are not correlated with household characteristics. However, mean-reverting measurement error stands out: households that used the light a lot tend to underreport, while households that used it little tend to overreport use. Last, general usage questions provide more accurate information than asking about each hour of the day. Sensor data can serve as a benchmark to test survey questions and seem especially useful for small-sample analyses.

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