Referee Report: Liberation technology: Mobile phones and political mobilization in Africa

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1 Overview

As digital information and communication technology sweeping across the world, the authors of the paper try to answer whether mobile phone serves as a 'liberation technology' which fosters mass political mobilization in Africa as well as the mechanisms of its impact. To accomplish their goal, the authors use a novel georeferenced data set for the entire African continent between 1998 and 2012 on the coverage of mobile phone signal together with georeferenced data from multiple sources on the occurrence of protests and on individual participation in protests to perform empirical analysis. They find strong and robust evidence in support of their argument that mobile phones are indeed instrumental to political mobilization, but this occurs in periods of economic downturn when reasons for grievance emerge or the opportunity cost of protest participation falls.

2 Contribution

While the paper is not the first to bring up the idea of 'liberation technology', it proposes and empirically assesses a nuanced and qualified version of the liberation technology argument by investigating the heterogenous effect of mobile phone coverage over the business cycle and successfully find strong and robust evidence in support of it. Additionally, it explored the mechanisms through which mobile phones affect political mobilization. Given the concern that even within countries, protests and ICT adoption are correlated for reasons other than the causal effect of the latter on the former, the authors use an instrumental variable strategy that exploits differential rates of adoption of mobile phones across areas characterized by different average incidence of lightning strikes which is very creative. The paper is submitted to Econometrica and it is a good fit since it employs econometric models and methods.

3 Theory

The authors believe that protests respond to the state of the economic cycle, increasing during recessions and falling during booms. Worsening economic conditions can increase the incidence of protests because they provide reasons for grievance and because they reduce the opportunity cost of participating in mass mobilization. Thus, They present a regression model that expresses protest occurrence as a function of mobile phone diffusion and its interaction with the state of the economic cycle. Then, they turn to the micro-founded model that underlies this aggregate model and shows how data on protest participation and mobile phone use at the individual level can be employed not only to validate results based on aggregate data, but also in an attempt to disentangle and quantify the different mechanisms of impact.

4 Identification Strategy

To address concerns about the validity of the identification assumption raised when using the instrumental variable and 2SLS method, the authors perform a placebo test and show that there is no correlation between the instrument and the outcome variable in periods when mobile phone technology was unavailable. They also perform a number of additional tests that rule out a direct or indirect effect of the instrument on protests other than via mobile phone coverage. Moreover, in order to add transparency to the identification strategy, the authors present graphical evidence on the reduced-form relationship between protests and the instrument.

To be specific, since the paper uses an instrumental variable strategy that exploits differential rates of adoption of mobile phones across areas characterized by different average incidence of lightning strikes, considering that consistency of the 2SLS estimates relies on the assumption that, other than because of differences in mobile phone coverage and its differential effect over the business cycle, protest activity does not vary differentially over time across cells depending on average lightning strike intensity, to check whether this identification assumption might not hold unconditionally, the authors include in all regressions the available time-varying cell-level characteristics (log local population, log yearly temperature, log rainfall, and log night light intensity) as well as a large number of cross-sectional cell characteristics interacted with a linear time trend.

Also, they present a series of tests in support of their identification assumptions. First, they test whether lightning strikes and their interaction with GDP growth affect protests only through their impact on mobile phone coverage, or there is no correlation between the outcome variable and these variables in periods when mobile phone technology was not available. As an additional check, they test whether the instrument is correlated with other observed potential determinants of protests. Finally, to test for the validity of the exclusion restriction, they restrict to protests occurring during the months when lightning intensity is at is lowest and close to zero. This exercise aims to alleviate concerns that lightning directly discourages protest participation, leading to a spurious correlation between their instrumented measure of coverage and protest activity.

The placebo test strategy is neither novel nor unique, but the tests designed by the authors are very comprehensive and the strategy is rather feasible and transparent.

5 Data

This paper uses a variety of georeferenced data for the whole Africa covering a span of 15 years, from 1998 to 2012. The primary geographical units of observation in the analysis are cells of $0.5° \times 0.5°$ resolution, corresponding to areas of approximately 55×55 km at the Equator. Overall, the authors split the continent into 10409 cells.

The mobile phone coverage data are collected by the GSM association and are submitted directly by mobile operators thus the data represent a considerable improvement over similar sources of information used in previous studies since most cross-country studies typically employ measures of mobile subscription or penetration, which vary only at the country level. Moreover, the coverage refers to the GSM network, which is the dominant standard in Africa, with around 96 percent of the market share, which makes it a perfect estimate of mobile phone coverage in Africa.

Other data are similarly collected from reliable sources and are altogether used to compute a large array of cell characteristics including population, climatic variables, etc.

The authors show a map of mobile phone coverage over the entire continent at 5-year intervals in descriptive statistics which makes it more visual.

6 Empirical Analysis

The effect that is being identified is the occurrence of protests, or political mobilization, while the intervention is mobile phone coverage or mobile phone availability.

If modeling the occurrence of protests in a cell as a function of mobile phone availability, the regression model is

$$\overline{\mathrm{y}}_{jct} = \beta_0 + \beta_1 Cov_{jct} + \beta_2 \Delta GDP_{ct} Cov_{jct} + f_j + f_{ct} + u_{jct} \tag{1}$$

, where $\overline{\mathrm{y}}_{jct}$ denotes the the incidence of protests, Cov_{jct} is a measure of local mobile phone coverage, ΔGDP_{ct} is a measure of the country's economic growth, f_j and f_{ct} are cell fixed effects and country $\times$ year effects respectively, and u_{jct} denotes the error term. Conditioning on cell and country $\times$ year effects, parameter estimates capture the average effect of the explanatory variables on the differential growth in protests across cells in the same country. The coefficient β_1 in equation (1) captures the effect of mobile phone coverage on protests at zero GDP growth, while β_2 measures how country-level economic booms and downturns translate into differential protest activity in areas with different mobile phone coverage. If mobile phones magnify the effect of economic downturns on protests, this coefficient will be negative. With more restrictive specifications where the coefficientn β_2 is constrained to 0, parameter β_1 captures the effect of mobile phones on protests at average growth.

However, coverage is unlikely to be randomly allocated across areas, potentially generating a bias in the estimates of model parameters. To deal with this concern, the authors use an instrumental variable strategy. The first-stage equations of the 2SLS method are

$$Cov_{jct} = \delta_0 + \delta_1 Z_{jct} + \delta_2 \Delta GDP_{ct} Z_{jct} + f_j + f_{ct} + \eta_{jct} \tag{2}$$

$$\Delta GDP_{ct} Cov_{jct} = \theta_0 + \delta_1 Z_{jct} + \theta_2 \Delta GDP_{ct} Z_{jct} + f_j + f_{ct} + \mu_{jct} \tag{3}$$

, where $Z_{jct} = lighting_{jc} \times t$, $lighting_{jc}$ denotes the average number of lightning strikes in a cell over the period 1995-2010 and t denotes the linear time trend.

The authors show all the main specifications of their main model. It not only employs instrumental variables but also fixed effects as well as the interaction of economic growth and mobile phone coverage, all contributing to ruling out bias. To improve the empirical analysis, the authors may use ΔGDP_{jct} instead of ΔGDP_{ct} because that even within countries, different areas can have different economic growth.

The empirical results show that greater lightning strike activity leads to a slower adoption of mobile phone technology. For the model to be well specified, the coefficient of Z is expected to be similar to the coefficient of $Z\Delta GDP$, which is indeed the case (-0.006 compared to -0.015). Also, Sanderson and Windmeijer's conditional first-stage F-statistics for the validity of the instruments are reported. As the Stock–Yogo 10 percent and 15 percent critical values for a perfectly identified model with two endogenous variables are, respectively, 7.03 and 4.58, it can be rejected that the instruments are weak.

The authors use data from GDELT, ACLED and SCAD respectively, all patterns of estimates are very similar. Although point estimates based on ACLED and SCAD are smaller in magnitude than those based on GDELT, the results based on the three data sets are qualitatively similar. In all cases, they conclude that in their sample of countries and years, characterized by strong average economic growth (4.9 percent), greater coverage did not lead per se to greater protest incidence. However, they do find that mobile phone coverage played a significant role in magnifying the effect of recessions on protest occurrence, with an effect that is both statistically and economically significant.

However, in the regression the authors constrain the effect of coverage to vary with GDP growth in a linear fashion, thus their results may be driven by this functional form assumption. To address this, they report separate 2SLS estimates of the effect of coverage on protests by percentile of the distribution of ΔGDP. In practice, they estimate 50 parameters by groups of two percentiles. They confirm graphically that the effect of mobile phones on protests manifests largely during economic downturns which makes sense for, during economic boom, protests themselves are rare.

7 Mechanisms

To identify potential mechanisms, the authors introduce a micro-founded model of protest participation that is consistent with the aggregate model mentioned above and it allows them to investigate the channels through which mobile phones may affect protest participation.

The authors argue that the private cost of participation in a protest falls when the economy deteriorates, and the individual utility from participation increases with the fraction of connected individuals participating. Individuals make educated guesses about the probability of their connections participating given the degree of connectedness in society, which is publicly known. To illustrate, focusing on the stable equilibrium, Worse economic conditions increase participation through two channels. First, they increase peoples' willingness to participate, a mechanical or purely compositional effect that they attribute to individuals' information about the state of the economy; Second, via a spillover effect that results from strategic complementarities in protest occurrence, an effect that they attribute to coordination among individuals.

The authors believe that mobile phones have the potential to affect both margins of response, namely to make individuals more responsive to variations in economic conditions—an effect they label enhanced information—and to changes in others' willingness to participate—an effect they label enhanced coordination.

However, this story should be taken with caution, as the authors ignore the potential nonrandom allocation of coverage across areas. The data from the Afrobarometer only span a limited number of cells/years over which trends in lighting strikes have relatively little power predicting variations in coverage.

8 Threats to Validity

The most important assumption in this paper is the identification assumption that, other than because of differences in mobile phone coverage and its differential effect over the business cycle, protest activity does not vary differentially over time across cells depending on average lightning strike intensity.

This identification assumption might not hold unconditionally, as lightning strikes could be correlated with geographical variables (i.e., distance to the coast or longitude and latitude), climatic variables (i.e., rain and temperature), or the availability of other infrastructures or services (i.e., electricity) that might have an independent effect on protests.

Thus, the paper include a set of exhaustive robustness checks. Consistent with the identification assumption, one can see that there is no effect of the instrument interacted with GDP growth on protests in the early period, that is, effectively up until the late 1990s. Also, the authors test whether their instrument is correlated with other observed potential determinants of protests and find that none of them appears to be correlated with GDP growth. Finally, they test the validity of the exclusion restriction by restricting to protests occurring during the months when lightning intensity is at its lowest and close to zero. Regression results imply that their findings are not driven by a direct effect of lightning on protests. It is rather difficult to come up with other threats to validity which require robustness check thus I think the authors have adequately addressed these potential violations.

9 Comments/Questions

1. Is protest the only one form of political mobilization? The authors did not include riots, strikes, wars, coups, social media discussions and communal violence when assessing political mobilization.

2. Among the 3 sources of information on protests, only the ACLED provides, for each protest, information on the number of participants. Which can better represent political mobilization, number of protesting activities or number of protesting people?

3. The authors did not take government regulations on social media within countires into account. It is reasonable for the data only expands to 2012 before which most mobile phones in Africa did not have as many functions as today. However, current mobile phones are clearly not only 'phones' thus the results' external validity is debatable. As the authors mention in the conclusion, tech-savvy autocracies in other regions of the world may well appropriate this technology for their own ends.

4. The tables/graphs are self-contained and easy to follow. The figure 1 which shows the map of mobile phone coverage over the entire continent at 5-year intervals is especially impresive.

5. The paper is well-written and easy to follow for its simple structure.

6. The policy implications of the paper are not clearly spelled out. It is not reasonable to expect more mobile phones to bring down autocratic regimes unless they are poor countries with low state capacity.

10 References

[1] M. MANACORDA AND A. TESEI(2020): "Liberation technology: Mobile phones and political mobilization in Africa", *Econometrica*, Vol. 88, No. 2, 533–567