Mobile Internet, Local Development and the Quality of Elections: Evidence from Rural Malawi

Alex Yeandle

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Abstract

What explains variation in the quality of elections, and how is this shaped by information technology (ICTs)? Scholars have typically focused on one causal mechanism - falling information and co-ordination costs make it easier to monitor officials, disincentivising malpractice. This paper advances an alternative account. ICT provision drives local economic development, fostering support for the ruling party. For pro-government election officials this reduces the need to behave irregularly, while it incentivises greater malpractice among their pro-opposition counterparts. I test this argument in Malawi, studying how 3G internet coverage affects polling booth outcomes in a contested election. Irregularities reduce in areas dominated by the government but rise in opposition strongholds. In addition, household panel data suggests coverage has developmental effects which drive shifts in incumbent support. The paper recasts ICTs through a materialist framework of technological change, while also contributing to the literature on parties and elections in new democracies more broadly.

1 Introduction

Around the world, parties regularly win elections marred by irregularity. Motivated by lack of popular support, fear of reprisal or even unconscious bias, election officials behave in ways that selectively benefit one party at the expense of another (Birch 2011). While ruling parties can influence security services, media outlets and courts, opponents can compensate in their own strongholds (Sjoberg 2014). And so begins a vicious cycle in which election integrity, and thus the quality of democracy, declines.

In theory, though, skewing elections has become increasingly difficult over time. On the one hand, domestic and international election observation has fast institutionalised, placing genuine constraints on officials' capacity to commit overt breaches of the rules (Hyde 2007; Daxecker 2014; Asunka et al. 2019). On the other, technological change has reshaped information asymmetries between citizens and the state. In much of the developing world, large swathes of the electorate have gained access to internet-capable mobile devices, significantly reducing the costs of sharing information and coordinating collective action (Kosec and Wantchekon 2020). Voters can share what officials do and mobilise in response, with both distrust in government (see Guriev, Melnikov, and Zhuravskaya 2021) and protest activity (see Manacorda and Tesei 2020) tending to rise as mobile internet proliferates. Such monitoring-based accounts are central to studies finding negative effects of coverage on election irregularities (Gonzalez 2021). So why, more broadly, do such irregularities persist?

Part of the confusion stems from generalisability. Monitoring clearly deters; there is significant evidence that careful interventions, like sending observers to polling stations (Ichino and Schündeln 2012; Enikolopov et al. 2013; Asunka et al. 2019) or using technology to systematically photograph ballots (Callen and Long 2015; Callen et al. 2016), reduces irregular behaviour. But connecting these results to the wider provision of ICTs, and thus macro level outcomes, is harder. Election observers are never present at *every* polling station, and the majority of people do *not* use their personal devices to engage in citizen monitoring. Voters tend to be unaware of irregular activity in their own *local* area (Daxecker, Di Salvatore, and Ruggeri 2019), responding instead to wider, *national* narratives (see Tucker 2007). Moreover, parties can substitute malpractice from monitored to unmonitored areas, leaving no substantive change in aggregate (see Ichino and Schündeln 2012).

This paper offers an alternative explanation, rooted in technology-driven economic

development. While the ability of information communication technologies (ICTs) to reduce information costs clearly matters, their spread also contributes to material, economic shifts. Scholars have considered a multitude of ways in which technologies like mobile phones and fast internet make people wealthier, ranging from local job creation (Aker and Mbiti 2010) to agricultural arbitrage (Duncombe 2016) to the pooling of financial risk (Aron 2018). And there are long-standing arguments to suggest such changes have profound electoral consequence (see Schumpeter 1942), such a framework has not yet been applied to the expanding provision of ICTs.

I propose a development-based mechanism that connects ICTs to the quality of elections. As new technology spreads, locally affected voters become tangibly wealthier and more supportive of the incumbent government. In government strongholds, where locally recruited officials are likely to favour the incumbent, this *reduces* the incentive to engage in malpractice. But in opposition dominated areas, where officials are likely biased against the incumbent, the opposite is the case. ICTs can increase election quality, but only, paradoxically, in areas where officials support the government. This offers a new way to think about democracy and development's mutual dependencies (Lipset 1959), speaking to work that stresses the importance of subnational variation in the quality of elections (see Behrend and Whitehead 2016).

I apply this general argument to the case of Malawi, studying the impact of 3G internet in the country's 2019 Presidential election, later overturned due to irregularities (Nkhata, Mwenifumbo, and Majamanda 2021). One such irregularity was the arbitrary rejection of ballots (European Union 2020) - votes being rendered null and void and hence discarded - a practice which shows clear signs of political bias across the incumbent and opposition parties' regional strongholds. With geocoded polling-station results and proprietary data on 3G coverage, I use a geographic regression discontinuity design (Keele and Titiunik 2018) to show that coverage *reduces* ballot rejection in government strongholds, but *increases* it in areas under opposition control. I make sense of this puzzling result with evidence from the Malawi household panel and AfroBarometer social survey. Consistent with a development-oriented mechanism, 3G coverage drives tangible increases in local living conditions, which are associated with greater support for the ruling party.

The theory and results of the paper make a series of contributions to the literature. By presenting a new framework for understanding subnational variation in election integrity, the piece develops existing explanations and offers an alternative to a predom-

inant focus on monitoring. In fleshing out the material consequences of ICT provision and their downstream effects, the paper aggregates inter-disciplinary findings – from scholars of development economics to political behaviour - into a cohesive theoretical narrative. And empirically, by using such spatially fine-grained data, the implications of the argument are tested with greater precision than is usually possible in similar studies.

Beyond academic debates, though, this paper matters because the quality of elections matters. Flawed plebiscites corrode faith in politics and distort the accountability mechanisms on which democratic theory rest (see e.g. Kudamatsu 2012; Fujiwara 2015; Ofosu 2019; Harding 2020). By furthering our understanding of the causal mechanisms driving irregularities, in a context of rapid technological change around the globe, this paper offers progress.

2 Theoretical Framework

2.1 ICTs and the quality of elections

Why do ICTs matter for the quality of elections? Scholars have long connected the provision of ICTs – information communication technologies - to election integrity. ICTs make it cheaper and faster to share information, allowing for the monitoring of election officials in real time, or for citizens to credibly threaten collective action in response to malfeasance. These logics speak to a burgeoning literature on ICTs' political consequences more broadly, and their capacity to inform voters about government performance.

A first tranche of studies focus on how technological innovation can detect, and deter, corrupt behaviour. This work bases itself around more general analyses of monitoring, and highlights the potential for ICTs as a new, cheap, tool to achieve this end (e.g. Schuler 2008; Bertot, Jaeger, and Grimes 2010; Bardall 2013; Baguma and Eilu 2015; Iwuoha 2018; Sassetti 2019). Carefully designed interventions have mimicked the "ideal" ways in which ICTs might function, with a wave of experimental work showing that sending observers to photograph election returns (Callen and Long 2015; Callen et al. 2016), setting up reporting hotlines (Aker, Collier, and Vicente 2017), or using social media to incentivise citizen monitoring (Garbiras-Díaz and Montene-

gro 2022) appears to significantly reduce malpractice. This speaks to an experimental literature on election monitors more generally and the ways in which officials might respond. In Ghana, for instance, both Ichino and Schündeln (2012) and Asunka et al. (2019) suggest that officials substitute irregularities from monitored to unmonitored polling stations. While this minimises the aggregate electoral impact of malpractice, it nonetheless offers evidence that monitoring has a strong deterrence effect.

A limitation of this literature, though, is that targeted experimental interventions do not reflect how ICTs are more widely used in practice. While access to mobile phones and internet-capable devices has skyrocketed across the developing world (see Kosec and Wantchekon 2020), it is implausible that most users carry out precise monitoring interventions *of their own accord*. Despite this, scholars still find that aggregate changes in ICT provision, away from targeted interventions, continue to have significant effects on political behaviour. In Afghanistan, Gonzalez (2021) shows that fraud significantly declines at polling stations just inside mobile coverage. In Malaysia, Miner (2015) shows how the roll out of fast internet led to the electoral defeat of a semi-authoritarian regime. There is cross-national evidence that ICT proliferation can drive protest (Christensen and Garfias 2018; Manacorda and Tesei 2020; Fergusson and Molina 2020) and political violence (Pierskalla and Hollenbach 2013; Shapiro and Weidmann 2015). And with a global sample, Guriev, Melnikov, and Zhuravskaya (2021) find that 3G internet broadly reduces trust in government, with particular sensitivity to corruption scandals. Each of these studies highlight the informational effect of ICTs, with a particular focus on how provision fosters collective action and citizen monitoring among a more informed electorate.

Despite clear evidence that aggregate ICT proliferation can shape election integrity, though, empirical support for the monitoring-based mechanism, at the local level, is on weaker grounds. Under a *deterrence* logic, election officials fear being caught out by election observers, or by the credible threat of citizen collective action. Yet election observers regularly use satellite phones to travel to areas outside mobile phone coverage (Igboechesi 2019), while citizens tend to mobilise around national-level narratives of fraud rather than be responsive to local variation in malpractice (Daxecker, Di Salvatore, and Ruggeri 2019). Part of this might stem from the spread of election-specific misinformation campaigns carried out over social media, suggesting ICT users are unlikely to engage in citizen monitoring outside experimental interventions.[1] And while

[1]Note that this argument also suggests citizens beliefs about fraud can become detached from

3G internet can reduce trust in government, other work suggests mobile coverage, and communications technology more broadly, can *increase* support for ruling parties under certain circumstances (Strömberg 2004; Grossman et al. 2021).

Why, then, do ICTs exhibit aggregate effects on election integrity? If not through monitoring and information, how else might these effects arise? I now turn to an alternative route by which ICTs may influence political behaviour; their effects on local economic development.

2.2 ICTs and economic change

Alongside monitoring and collective action, the ability of ICTs to reduce information costs has a range of other consequences. That technological change drives productivity is a foundational premise for many theories of economic growth (see Solow 1956; Swan 1956), and scholars make similar arguments when considering rapid spread of ICTs (see Biagi 2013). This is especially true in poorer parts of the world, where the marginal effect of new technology is most profound.

A significant literature in development economics has studied the economic impacts of recent expansions in ICT access. Duncombe (2016) considers how farmers face reduced "search costs" for market prices, and can arbitrage effectively against urban counterparts. Aron (2018) considers how access to mobile money can facilitate risk pooling in rural communities, while Roessler et al. (2021) considers how women become more likely to start new businesses and gain financial independence. Hjort and Poulsen (2019) discuss how the arrival of fibre-optic broadband in Sub-Saharan Africa boosted the productivity of existing businesses and their hiring patterns, while in a review article Aker and Mbiti (2010) note the significant formal and informal employment generated by communications infrastructure projects, alongside their inevitable local spillovers.

While it is not certain which of these mechanisms matter the most, there is broad consensus around the idea that ICTs can boost local economic performance. This consensus is matched by national governments, international organisations, and donor agen-

where "objective" irregularities take place. Such citizens might well still mobilise on the basis of false beliefs, as recent events in the United States demonstrate. But this mobilisation will not correspond to true local variation in electoral malpractice, and will thus have more nuanced implications on the behaviour of election officials.

cies, who often place high priority on expanding access to ICTs in rural areas. Ensuring universal access to ICTs is a stated UN sustainable development goal (Blazhevska 2017), while national governments regularly come under attack for the lost *economic* opportunities of coverage gaps.[2] But unlike ICTs' informational effects, these positive economic spillovers have yet to be directly connected to political outcomes. This paper begins to fill this gap in the literature.

2.3 Moving beyond monitoring

Thinking of ICTs as an engine for growth, and not *just* information, opens new paths to political outcomes. It is well documented that the distributional effects of technological change can profoundly shape the political balance of power (Schumpeter 1942). But even small-scale, individual-level changes in living conditions can be enough to shift electoral support for the incumbent. As the incumbent becomes more legitimately popular, pro-government officials will act more legitimately while their pro-opposition counterparts behave more irregularly. And thus ICTs have heterogeneous impacts on the quality of elections, through a different set of causal mechanisms.

In isolation, each of these steps find empirical support in existing literature. First, mobile coverage and 3G internet have been linked to local economic development in a myriad of ways. Most compelling are arguments rooted in *market-driven*, private sector development, as businesses become more productive and hire more locals who thus enjoy greater private consumption.[3]

> **H1 (Development | ICT provision):** ICT provision has a positive effect on local economic development.

A logical conclusion is that voters who see their living conditions improve will become more supportive of the ruling party. In line with simple models of retrospective voting, improvements to a household's material wellbeing offer a positive signal of incumbent

[2]For instance, in Malawi the national government came under fire after a report from its communications regulator suggested coverage gaps were costing the economy up to $13 million per year (Phiri 2021).

[3]Less compelling are arguments rooted around *politics-driven* development, such as improvements in the provision of public services. While ICTs might in principle allow for more targeted public spending, or make it easier for citizens to lobby politicians for support, experimental work in this area yields very mixed results (Grossman and Slough 2022).

quality, something for which they are rewarded at the ballot box (Fearon 1999). These arguments have been most rigorously examined in advanced capitalist economies (see Stegmaier, Lewis-Beck, and Park 2017), wealthy nations where the marginal impact of ICT provision is likely small.[4] But there is considerable evidence that voters around the world condition their voting behaviour in this way too. Across Sub-Saharan Africa, the region in which this paper focuses, economic development is regularly cited by voters as the most important issue facing their country (Bleck and Walle 2018). A vast body of work suggests that these electorates are highly sensitive to changes in living conditions, driven by both the provision of local goods and services (see e.g. Harding 2015) and pocketbook changes in personal circumstance (Bratton, Bhavnani, and Chen 2012; Weghorst and Lindberg 2013).[5] Thus, if ICTs have tangible effects on living standards, there should be some positive electoral effect for the government.

> **H2 (Incumbent Support | Development):** Areas with greater local economic development are more supportive of the incumbent President, and more likely to re-elect them.

Finally, if polling booths under ICT provision become more supportive of the incumbent, an official's response will be determined by their own partisan bias. For an official who favours the government, an increase in *legitimate* government support will reduce the need to behave irregularly. But for an official biased toward the opposition, the opposite is the case; now there is an incentive to behave even more irregularly, in an attempt to discount rising support for the ruling party.[6]

[4] At least in the present day. Historical studies of communications technology roll outs might offer a better parallel, a compelling example being Strömberg (2004)'s analysis of local radio in the US making voters more responsive to local New Deal spending, or Iyengar (1990)'s work on television and the nationalisation of politics. Other works have concentrated on less distinctively "economic" aspects of voting behaviour, like political participation (Yeandle 2021).

[5] There are caveats with respect to responsibility attribution. For instance, in highly ethnic political arenas some voters remain biased in when assigning credit for positive outcomes (Adida et al. 2017), while some withdraw support if the provision of public goods is seen as corrupt (Kadt and Lieberman 2020).

[6] This intuition is particularly well suited to explain arbitrary ballot rejection, the focus of this paper. It diverges from some other studies on the microfoundations of polling officials' behaviour. Rundlett and Svolik (2016), for example, argue that election fraud will *increase* in incumbent support, because the likelihood of the incumbent winning overall is higher (and the corresponding risk of prosecution declines). But this general comparative static applies primarily to countries where only one political party exerts control (with an empirical analysis of elections in Russia). In countries like Malawi, where support is strongly concentrated in regions and there exist so called "no-go" areas for both ruling and opposition parties, I argue the partisan biases of officials themselves offer a better explanation.

H3a (Irregularities | Incumbent Support & Pro-Incumbent Bias): Polling booth officials who favour the incumbent are less likely to behave irregularly when local incumbent support rises.

H3b (Irregularities | Incumbent Support & Anti-Incumbent Bias): Polling booth officials who favour the opposition are more likely to behave irregularly when local incumbent support rises.

Taken together, this account suggests that ICTs will have heterogeneous impacts on election integrity. In government strongholds, where officials are likely biased in favour of the ruling party, irregularities should decline. In opposition strongholds, where officials' bias likely runs the other way, irregularities will instead rise. Unlike monitoring-based frameworks, this effect arises *organically*; ICTs proliferate and shape development, which in turn impacts the quality of elections. There is no need to make any assumptions about voters' information, the threat of collective action, the capacity to monitor, or the deterring power this has over officials.

H4a (Irregularities | ICT Provision & Pro-Incumbent Bias): There will be fewer election irregularities at polling booths affected by ICT provision and in which officials favour the incumbent.

H4b (Irregularities | ICT Provision & Anti-Incumbent Bias): There will be more election irregularities at polling booths affected by ICT provision and in which officials favour the opposition.

This set of sequential hypotheses are summarised in the path diagram below, connecting ICT provision to local variation in election quality.

3 Testing the Argument in Malawi

3.1 The 2019 Presidential election

I test the implications of a development-oriented framework of election integrity in Malawi. Malawi is one of many "third-wave" democracies in Sub-Saharan Africa,

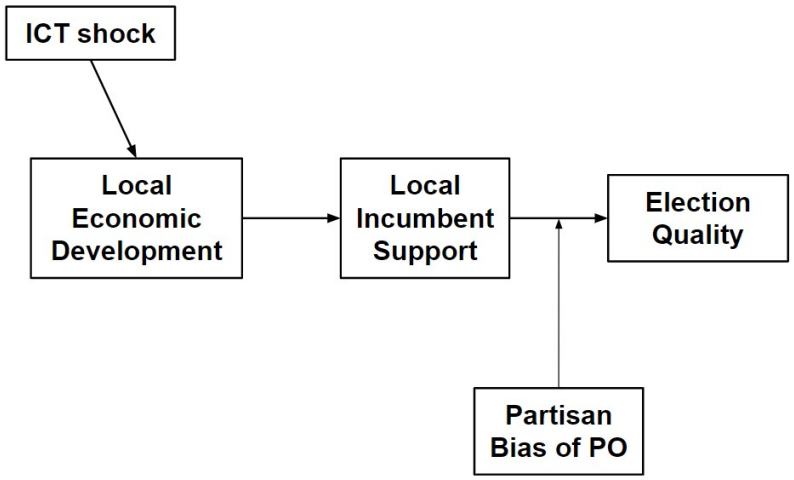

Figure 1: Summarising the Causal Mechanism

with continuous multiparty elections being held in the country since 1994 (Cheeseman 2015). These elections are meaningful, with clear evidence that Malawian voters reward or punish the government for its performance, and that government has become more responsive since democratisation.[7] But they are also imperfect, with regular complaints about fraud, irregularities and malpractice (Patel and Wahman 2015). State-owned media outlets are often biased towards the government (Kainja 2021), and campaign violence and voter intimidation do occur, albeit to a lesser extent than in neighbouring countries (Dionne and Dulani 2014; Borzyskowski and Wahman 2021). Perhaps most importantly, there is strong *regional* variation in party support, making it feasible that polling station officials carry different biases when drawn from different party strongholds (see Boone et al. 2022).

Malawi is also a poor country. Despite significant improvements in recent years, the Malawian economy remains one of the smallest in both the world and Sub-Saharan Africa, with a significant portion of its population below the poverty line and a low human development index score. After adjusting for purchasing power parity, Malawi's 2022 GDP per capita was just $1,658, around half that of its neighbour Zambia (World

[7] A series of single-country studies demonstrate Malawian voters' responsiveness perceptions of government performance, from food security to agricultural subsidies to corruption (see Ferree and Horowitz 2010; Mpesi and Muriaas 2012; Dionne and Horowitz 2016; Dulani et al. 2021). In addition, much of the cross-national literature on democratic outcomes includes Malawi as part of the sample, showing the positive effect of free and fair elections on infant mortality, education spending and the provision of public goods (e.g. Baum and Lake 2003; Kudamatsu 2012; Harding and Stasavage 2013; Harding 2020).

Bank 2022). Low income and poor access to basic goods and services are particularly prevalent in rural areas, many of which remain isolated by lacking infrastructure and exposure to harsh weather (Engel et al. 2022). Despite this, however, government and private-sector programmes have seen significant improvements in mobile technology in recent years (Marron et al. 2020). I specifically concentrate on 3G internet coverage in rural parts of the country, an ICT with considerable potential for driving local economic growth.

Taken together, Malawi's political and economic circumstances make it an ideal case for studying a development-oriented theory of election integrity. On the one hand, persistent complaints of ballot irregularities and sharp spatial variation in party support suggest that there is significant subnational variation to be explored. The Malawi Election Commission also publishes polling-booth level election results data, allowing for analysis of distinctively local trends. On the other, poor economic health suggests that technological change has enormous developmental potential compared to other parts of Africa, or indeed the world. And this is especially true in the country's less connected rural areas.

In this paper I concentrate on Malawi's 2019 Presidential election. The vote saw incumbent Peter Mutharika re-elected, only for the results to be successfully challenged in the supreme court due to irregularities, with the opposition winning the re-run in 2020 (Nkhata, Mwenifumbo, and Majamanda 2021). "Tripartite" elections were held in 2019, simultaneously electing local councillors, MPs and the executive, though it was the re-election of the President that generated the most controversy (Cotterill 2020). The 2019 plebiscite has been dubbed the "tipp-ex election," after polling officials reportedly used tipp-ex, a white correction fluid, to alter results sheets (Gwede 2020). There was also significant concern about ballots being arbitrarily rejected (European Union 2020), which I use as a proxy for local irregularities. I now turn to analysing patterns of ballot rejection to defend its relevance as a proxy, before considering the rollout of 3G mobile internet in rural parts of Malawi.

3.2 Ballot rejections as an election irregularity

Measuring election irregularities is a difficult process, since polling officials might wish to benefit one party over another but with clear incentive to avoid egregious breaches of election law. Scholars must turn to proxies - changes in political outcomes which

deviate from what we would expect in a free and fair election - as an indirect measure of irregularity. Existing studies, for instance, have used spikes in incumbent support, turnout and registration, (Myagkov, Ordeshook, and Shakin 2009; Ichino and Schündeln 2012; Rozenas 2017), alongside digit-based counts of vote tallies (see Beber and Scacco 2012), as indicators of illegitimate behaviour.

In this paper I focus on the selective rejection of ballots as a measure of irregularity. Ballots that are incorrectly marked cannot be included in official vote tallies, and in any election a small number of votes will be discarded in this way. For instance, voters might select too many candidates, misplace a cross or deliberately spoil their ballot in protest. But some officials will also reject ballots that should, technically, have counted, or accept borderline cases for one party but not for another. It is on this selective use of rejection, to benefit certain candidates over others, that this paper focuses (Birch 2011; Friesen 2019).

How can we know whether ballots are rejected selectively or legitimately? Without being able to see and assess original papers, it is not possible for a researcher to directly observe whether a rejection is genuine or not (Friesen 2019; Kouba and Lysek 2019). Nonetheless, I present a series of qualitative and quantitative evidence from Malawi consistent with partisan bias in the rejection process.

First, official election monitor reports explicitly comment on suspicious rates of ballot rejection in some parts of the country. In the EU election observer report, it is noted that "proper procedures were not followed in 15 out of 32 polling stations where [EU] teams observed, which also includes inconsistent and random decisions about null and void votes" (European Union 2020, p31). The report also goes on to say that many rural areas had a "percentage of null and void ballots (that were) excessively high" (p71). African Union observers reached similar conclusions, describing polling officials' "inability to reconcile" total voting tallies with the number of rejected ballots (p28), alongside pointing out that "the target of having less than 1.09% of null and void ballots in all elections was not met" (p16) (African Union 2019). Observers from the Commonwealth agreed, reporting that "there were inconsistent interpretations of what constituted a null or void vote" (Commonwealth Observer Group 2019, p3). While these reports do not suggest that ballot rejection clearly benefitted one party or another, they do indicate an arbitrariness and inconsistency with which decisions were made.

Second, I build on this arbitrariness to consider aggregate patterns of where rejections took place, with clear signs of political bias. Under the null hypothesis - that all rejected ballots were done so legitimately - their distribution should be somewhat uniform across the country. But if rejections correlate with party vote shares, it suggests irregularities may be in play (Friesen 2019).[8]

In Malawi, I suggest that ballot rejection patterns are partly determined by the partisan bias of polling booth officials. As in most democracies, officials in Malawi are volunteers drawn from the local community. For instance, many polling centres are located in schools, where most officials are local teachers. And as with many African democracies, party support follows very strong regional divides. The then ruling Democratic Progressive Party (DPP) has a stronghold in the south, while the Malawi Congress Party (MCP) - then the main opposition - has strong roots in the Central region after governing Malawi as a single party after independence (Kalipeni 1997; Thorold 2000; Chunga 2020; Boone et al. 2022).[9]

Taking into account these geographical tenets of support, I propose that the bias of polling officials will likely vary *between* regions in Malawi. Officials drawn from communities in the Southern region are, on average, likely biased toward the DPP, while those drawn from the Central region are likely more favourable toward the MCP.[10]

I compare the effect of ballot rejection on party support, at the polling station level, in the 2019 election. If ballots are selectively rejected to the benefit of a given party, we would expect them to be concentrated in areas where that party is *less* popular (and where opponents hence garner more support). In a party's stronghold, we should thus expect a *negative* association with vote share.

[8]We might expect some "legitimate" variation to correlate with factors predicting voters' capacity to cast a valid ballot, such as literacy. But in Malawi, as elsewhere, such factors will overwhelmingly affect voters in remote rural areas. We know that incumbent governments in Africa tend to perform better in such places (Harding 2010), and this should hence bias *against* a negative relationship between ballot rejection and incumbent support.

[9]Malawi's third major party, the UTM, is concentrated in the Northern Region. The DPP is a breakway faction of the UTM formed in 2005, and the UTM has since oscillated in its support for the government. Until very recently, the DPP maintained a presence in the North as well (Ferree and Horowitz 2010), while in the 2020 rerun election the UTM was part of a formal opposition alliance with the MCP. It is thus less clear that in 2019 the Northern Region was a "stronghold" for either the government or opposition, and it is less clear how we should expect officials there to behave. For this reason I concentrate on the Southern and Central regions in the analyses that follow.

[10]I am grateful to Boniface Dulani for suggesting that the partisan bias of officials will likely vary between regions.

The plot below provides evidence of regional bias in Malawi's 2019 election. In the Southern region, the historic stronghold of the ruling DPP, we see a negative effect on DPP vote share (c. 15% standard deviation) but nothing for the MCP. Yet in the MCP's stronghold, the opposite occurs; here there is no effect on DPP share, but a significant negative effect on votes for the MCP (c. 10% standard deviation). In both cases, the results suggest that the stronghold party benefits from ballot rejections in their respective regions. This is consistent with the idea that polling station officials are biased in a manner that aligns with the communities from which they are drawn.

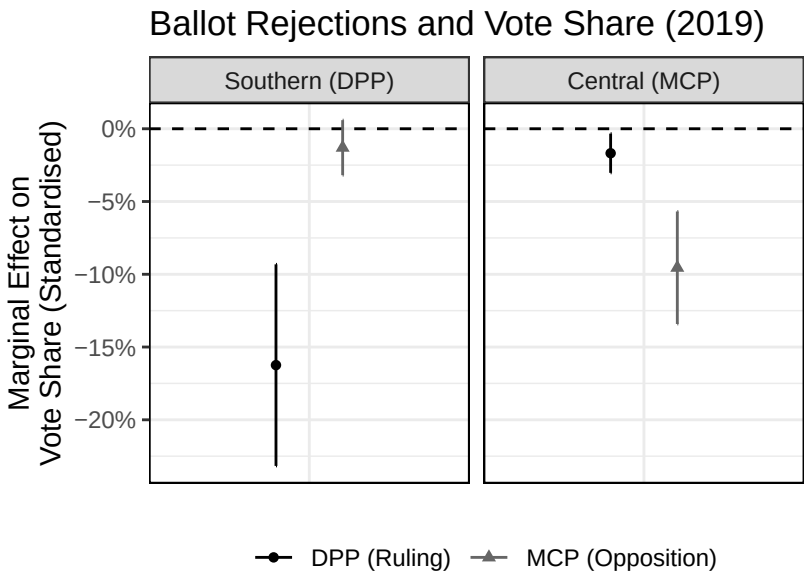

Figure 2: Marginal effect of the ballot rejection rate on party vote shares. Negative (positive) values suggests that a party is less (more) popular in areas with higher rejection, suggesting that rejection is differentially higher in areas where opponents perform well. The ruling DPP party is treated favourably only in its Southern region stronghold, while the main opposition MCP benefit only in their Central region stronghold. The results are consistent with biased polling officials, with bias varying between regions. For detailed results, see Table 1 in the supplementary materials.

3.3 3G internet in rural Malawi

To study the political effects of ICT provision, this paper concentrates on the spread of 3G mobile internet coverage in rural Malawi. 3G internet is a technology with potentially transformative effects, offering access to fast internet services in addition to pre-existing services for voice calls and SMS. 3G is central to Africa's "information revolution" (Kosec and Wantchekon 2020), allowing for enhanced access to news about

political events (Guriev, Melnikov, and Zhuravskaya 2021), but also facilitating greater economic productivity and growth (Mbiti and Blumenstock 2015).

In Malawi, as elsewhere in Africa, the spread of 3G coverage has been extremely uneven outside large urban centres. Due to harsh geography, low population density and a lack of pre-existing infrastructure, remote rural areas are typically the last places to receive access.[11] While those living in such areas may struggle to personally purchase devices, a benefit of the development mechanism is that, strictly speaking, this is not essential. So long as a handful of people in a community use a mobile phone, the economic spillovers should impact others too.[12]

I measure the extent of 3G coverage with digitised maps provided by the GSMA, who aggregate data directly from private providers. Figure 3 maps the distribution of polling stations and 3G coverage in Malawi's 2019 election.[13]

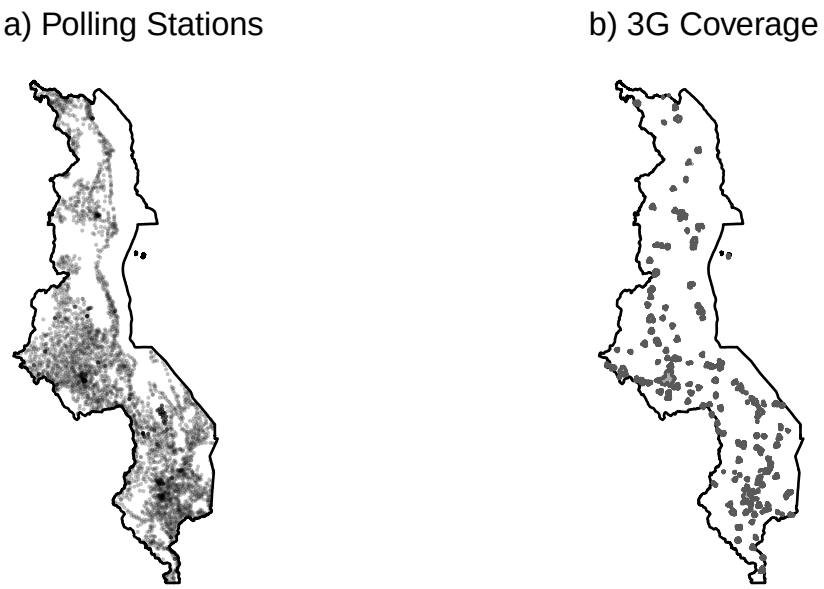

Figure 3: Spatial Distribution of Polling Stations and 3G Mobile Internet Coverage in Malawi (2019)

Within Malawi, coverage expansions do not appear to be driven by political bias. Coverage licenses are granted by the Malawi Communications Regulatory Authority

[11] For more information on both the dataset and the spread of coverage in Malawi, see the appendix.

[12] For instance, a farmer might use mobile internet to optimise their pricing strategy. With the increased income this brings, they might hire more people or spend more in village shops, even if the workers and shopowners themselves do not use a mobile phone.

[13] I am grateful to Ryan Jablonski for sharing geocodes for Malawian polling stations.

(MACRA), an independent body established by the 1998 (and later 2016) Communications Act (MACRA 2022). Cell tower construction and maintenance are handled by private sector providers TNM and Airtel, who are obliged to help identify coverage gaps and work to fill them (Phiri 2021). There is repeated pressure from across government to maximise coverage to all areas of the country, from ruling party MPs demanding competition to drive down prices for constituents (Nyirenda 2017) through to MACRA itself, which estimated that coverage gaps were costing Malawi around $13 million a year in GDP (Phiri 2021).

In the technical appendix, I also analyse patterns of coverage rollouts, showing that partisan bias is unlikely to be driving allocation decisions.

4 Headline Effects

To establish the headline effects of 3G coverage on election irregularities in Malawi, I exploit spatial discontinuities in coverage exposure. Comparing polling stations just in and outside of 3G reception, I show that coverage has markedly different effects in different parts of the country. This puzzling result does not fit the expectations of a monitoring-based framework, but is consistent with one rooted in local economic development.

4.1 Identification

To identify the reduced form effect of 3G coverage on ballot rejection, I make use of discontinuous exposure in peripheral rural areas. At the margins, I assume that stations fall arbitrarily in or outside of coverage, enabling for causal identification of the effects that coverage brings. If these stations have systematically different patterns of ballot rejection, we can reasonably infer that these patterns stem from differential exposure to 3G.

Such an approach has two central merits. First, since rural Malawi is sparsely populated, the villages to which polling stations align are usually quite far from one another. This minimises the risk of spillovers and noncompliance, which can bias the results of RD designs. Secondly, both polling stations and GSMA mobile coverage maps offer significant spatial precision, allowing for fine-grained measurement of *local* exposure in

a way that is rarely possible in social science research.[14] A handful of existing studies have used GSMA mobile coverage data in this way, either as a main specification or robustness, studying outcomes as diverse as election fraud through to public health (e.g. **gonzalez2020?**; Gonzalez 2021).

I use the co-ordinates of individual polling booths to code each as in or outside 3G coverage, alongside computing a measure of Euclidean distance to the nearest coverage boundary. This allows me to use a geographic regression discontinuity design (RD) to identify the local effect of coverage on ballot rejection. In geographic RD it is important to compare units in close vicinity to each other *as well as* being close to the boundary, typically done by defining small geographic *segments* and using segment fixed effects in the specification (Keele and Titiunik 2018). This feeds into the *boundary positivity* assumption, whereby each segment must contain units on both sides of the cut-off to approximate a counterfactual (Imbens and Zajonc 2011). In Malawi I satisfy this with ward-level fixed effects. By focusing within small, homogeneous administrative units, I smooth over larger socioeconomic differences between different parts of the country that might confound behaviour at polling booths close to the boundary but far away from each other. I then subset the sample to only include wards that contain polling booths in and outside of coverage. In the final dataset there are 1233 polling stations, spanning 137 wards. Each ward contains an average of 9 stations, of which 2 are inside coverage and 7 out.

I estimate specifications of the following form, for polling booths i in wards (segments) j. Our outcome measure - the share of rejected ballots - is denoted by y_{ij}. D_{ij} is a dummy variable indicating whether where a polling station is inside coverage, with $dist_{ij}$ denoting the Euclidean distance from the boundary. Ward fixed effects are captured by γ_j, and the analysis is restricted to polling stations within an optimal bandwidth around the boundary, following Calonico, Cattaneo, and Titiunik (2014).

$$y_{ij} = \beta_0 + \beta_1 D_{ij} + \beta_2 dist_{ij} + \beta_3 (dist \times D)_{ij} + \gamma_j + \epsilon_{ij} \tag{1}$$

[14]The GSMA coverage maps are taken directly from local providers and reflect their best understanding of the coverage distribution, used to inform investment decisions and future roll-outs. This accounts for local topography, such as elevation, which might influence coverage propoagation on the ground (see Crabtree and Kern 2018). Most importantly, there is no obvious incentive for providers to falsely report. See the supplementary materials for more detailed information about the coverage dataset.

Lastly, I subset the sample by region, to assess whether effects vary in different party strongholds. I focus on the DPP's stronghold in the south ($N = 470$), and the main opposition stronghold in country's centre ($N = 622$).

The key coefficient of interest is β_1, which, under certain identifying assumptions, captures the local average treatment effect (LATE) of coverage. In the technical appendix I scrutinise these assumptions in detail, showing evidence that there is no sorting across the cut-off (McCrary 2008), that spatially correlated compound treatments are unlikely to pose an issue, that Euclidean distance to the cut-off is conceptually appropriate (Keele and Titiunik 2018), and that there is broad balance across a wide range of covariates.

4.2 Results

Consistent with the theoretical framework, 3G coverage has significant effects on ballot rejection that vary between regions. In pro-government areas rejection goes down, while in opposition areas it tends to rise.

Figure 4 presents the main LATE of 3G coverage in both the Southern and Central regions. In the south, where officials likely favour the government, 3G *reduces* the rejection rate by around 3%. In the centre, where officials' likely support the opposition, rejection *rises* by a comparable amount (1.5%). In both cases, these results are consistent when the raw *number* of rejected votes, rather than the *rate*, is used as the dependent variable.

This finding is puzzling under a monitoring-based framework for understanding the effects of 3G coverage. If 3G makes officials more likely to get caught and hence deters biased behaviour, why should the effects vary between regions? Whether in opposition or incumbent dominated parts of the country, the personal risk to the official, and hence the expected negative deterrence effect, remains the same. If, however, we think of 3G's developmental effects as driving local support for the ruling party, the results logically follow. For pro-DPP officials in the south, rising DPP support reduces the *need* to reject ballots, while their pro-opposition counterparts in centre have an incentive to curtail the DPP's advantage by rejecting *more*.

Is there polling-station level evidence of a shift in ruling party support? Since ballot rejections are shaping which incumbent votes get counted and which do not, it is dif-

ficult to measure true, *latent* support using official election results alone. Nonetheless, the results in Figure 5 below do show some evidence consistent with the argument. In the Southern region, where officials are likely supportive of the incumbent, 3G has no significant effect on incumbent vote share. This makes sense, since in this region incumbent support is likely to be artificially inflated by biased ballot rejections in areas outside of coverage, removing any aggregate discontinuity. Yet coverage does have a negative effect in the opposition dominated Central region. Here we might expect support to be deflated by biased rejections in areas outside coverage, and further deflated still in areas inside. As the number of number of rejected ballots rises, the overall *share* comprised by the ruling party will decline.

Overall, the analysis finds support for H4a and H4b. Coverage has marked effects on ballot rejection, and consistent effects on vote shares, that vary by region in accordance with the likely partisan bias of local officials.

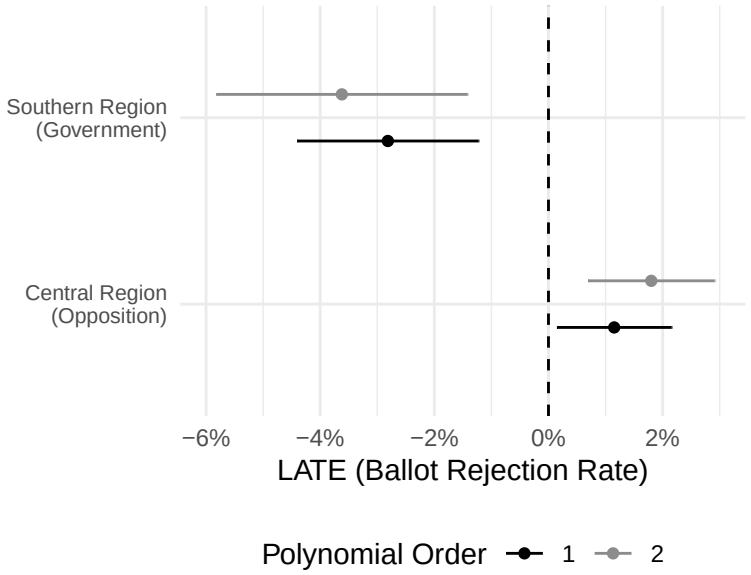

Figure 4: Regional Effects of 3G Internet on Ballot Rejection. Results are taken from spatial RD specifications broken by region, with coefficients presented from first and second order polynomials. Error bars represent robust 95% confidence intervals. The results suggest that 3G coverage leads causes ballot rejection in the Southern region to reduce by around 3%, but to increase by around 1.5% in the Central region. For detailed results, see Table 4 of the supplementary materials.

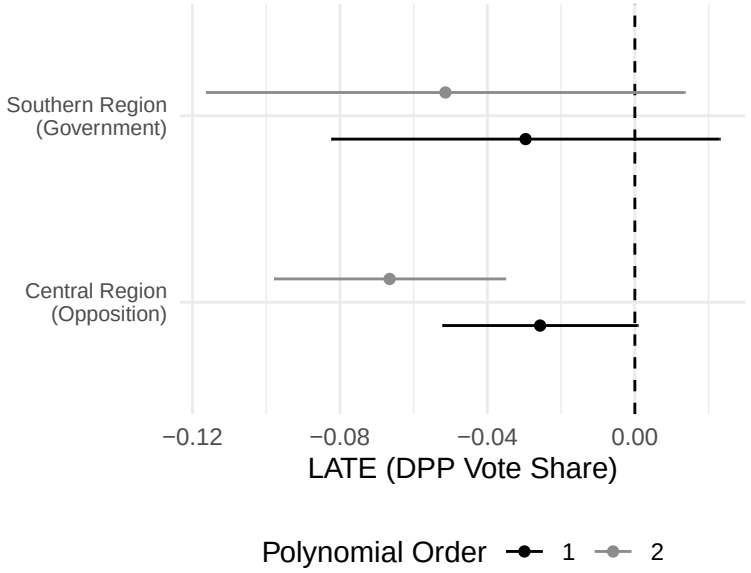

Figure 5: Regional Effects of 3G Internet on Ruling Party Support. Results are taken from spatial RD specifications broken by region, with coefficients presented from first and second order polynomials. Error bars represent robust 95% confidence intervals. The results suggest that 3G coverage leads causes vote share for the ruling party to decline in the opposition dominated Central region, with no significant effect in the incumbent stronghold of the South. For detailed results, see Table 3 of the supplementary materials.

4.3 Robustness

In the technical appendix I run a series of robustness checks to validate these headline findings.

From a *technical* perspective, I demonstrate robustness across a series of alternative specifications and bandwidths. To ensure that results are not driven by strategic sorting, I show that density is uninterrupted at the cut-off and that the results are consistent upon dropping observations close to the boundary.

From a *theoretical* standpoint, I use a difference-in-differences specification to see if stations which enter coverage since the past election have corresponding changes in ballot rejection and incumbent vote share. Since very few polling stations newly enter coverage in this period, the analysis is somewhat under-powered and there are not enough observations to credibly show regional heterogeneity (indeed, this is one of the reasons the geographic RD is preferable). Nonetheless, the analysis shows that, nationwide, ballot rejections decline as coverage expands. This offers an external validity check, through a different estimand, and instils additional confidence in the main result.

5 The Development Mechanism

These headline findings present a empirical challenge to monitoring-based frameworks of ICTs and election integrity. If 3G coverage *deters* officials from biased behaviour, then ballot rejections to decline across the board. But this is not what we see. While rejections do fall in the government stronghold, they rise significantly in parts of the country dominated by the opposition.

Conceptually, the findings make more sense under a development-oriented approach. 3G coverage leads to local economic development, which in turn boosts support for the ruling party. In pro-government areas, this incentivises officials to reject fewer ballots, while in anti-government areas it encourages them to reject more.

I now examine the preconditions to this development-oriented account. Unlike the effects on ballot rejection, existing literature offers much firmer priors about each of the earlier steps on the causal chain. Yet it is still useful to confirm that these phenomena apply in the particular case at hand. To do this, I first use data from the Malawi Household Panel to confirm that exposure to 3G internet has positive effects on household-level economic outcomes and subjective wellbeing. I then provide individual-level survey data consistent with the idea that rural Malawians condition political support on changes to their living conditions.

5.1 3G internet increases household wealth

The first stage of a development-oriented mechanism is that 3G coverage should be associated with improved living conditions. As discussed, there is strong precedent for this argument in the existing literature. To confirm that these findings travel to the current case, I take geocoded data from the Malawi Household Panel - a survey organised jointly by the United Nations and Malawian government - using repeat interviews with rural households in 2016 and 2019 ($N = 1776$). Households are randomly selected from enumeration areas around the country, the locations of which plotted in Figure 6 below.

I then use the fact that rural coverage expanded between the last two waves of the survey, fielded in 2016 and 2019 respectively. While the number of *polling stations* which newly enter coverage at this time was relatively small, the number of panel

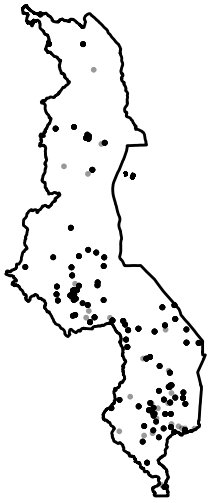

Figure 6: Spatial distribution of respondents in the Malawi Household Panel (2016-2019)

participants is larger, since multiple people are interviewed from the catchment areas of any one given voting site. I thus code each household as in or outside of 3G reception, based on the location of their enumeration area, and estimate the ATT of coverage using straightforward difference-in-difference specifications.[15] I average responses across a household, use household and year fixed effects, γ_h and α_t respectively, and cluster standard errors at the household level throughout.

$$y_{ht} = \text{inside}_{ht} + \alpha_t + \gamma_h + \epsilon_{ht} \tag{2}$$

The panel asks questions about a series of theoretically relevant economic outcomes. First, respondents are asked about their participation in the labour market, detailing how many hours per week they spend doing paid and unpaid work.[16] As seen below, households in areas that enter coverage spend an additional 3.5 hours on paid labour and around 2 hours less in unpaid work, offering some evidence of a substitution effect. This suggests that households living in areas covered by 3G plausibly increasing their purchasing power.

[15]This approach is not perfect, as enumeration area co-ordinates are randomly offset by up to 5km to protect respondent anonymity. I assume that this offsetting is independent to the location of 3G coverage, so any false positive and false negative coding errors should cancel in expectation.

[16]Paid labour refers to both formal and informal work, while unpaid labour refers to apprenticeships and subsistence agriculture. The results for each individual outcome can be found in the supplementary materials

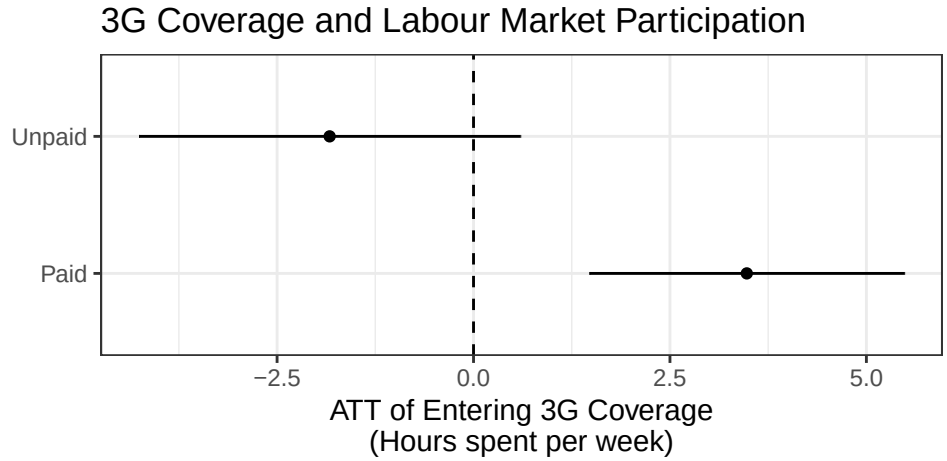

Figure 7: 3G coverage and labour market participation. Diff-in-diff estimates at the household level, for rural respondents in the 2016 and 2019 Malawi household panel survey, with 95% confidence intervals. The results suggest that households spend more time in paid labour upon entering 3G coverage. For detailed results, see Table 6 in the supplementary materials.

What are the consequences of spending more time in paid labour? Perhaps the most electorally important outcome is whether households feel better off, and face less uncertainty about their ability to meet basic needs. I turn to questions that capture households' subjective wellbeing, measuring beliefs about the adequacy of their food supply, housing situation, access to healthcare and clothing. I also consider how respondents feel about the wellbeing of their friends and neighbours.

Figure 9 shows the direct effect of 3G coverage on these outcomes. There are moderate improvements in housing ($p = 0.048$) and food security ($p = 0.11$), alongside some evidence that respondents believe their friends ($p = 0.092$) and neighbours ($p = 0.14$) have gotten richer, a sign of local development. Figure 10 considers the marginal effect of working an extra hour per week, comparing areas in and outside of 3G coverage. Inside coverage, paid labour has significant, substantively large effects across all four outcomes, while outside these effects are washed out. This suggests that paid labour significantly improves household's perceived well-being, but only in areas inside 3G coverage. Perhaps this effect stems from the fact that the 2016-19 coverage expansions targeted particularly remote, impoverished areas, in which the marginal economic value of paid labour is especially high. Alternatively, labour might just become generally more productive in areas inside coverage. Nonetheless, the results are consistent with the idea that coverage has positive effects on households' perceived living conditions,

and thus on local economic development.[17]

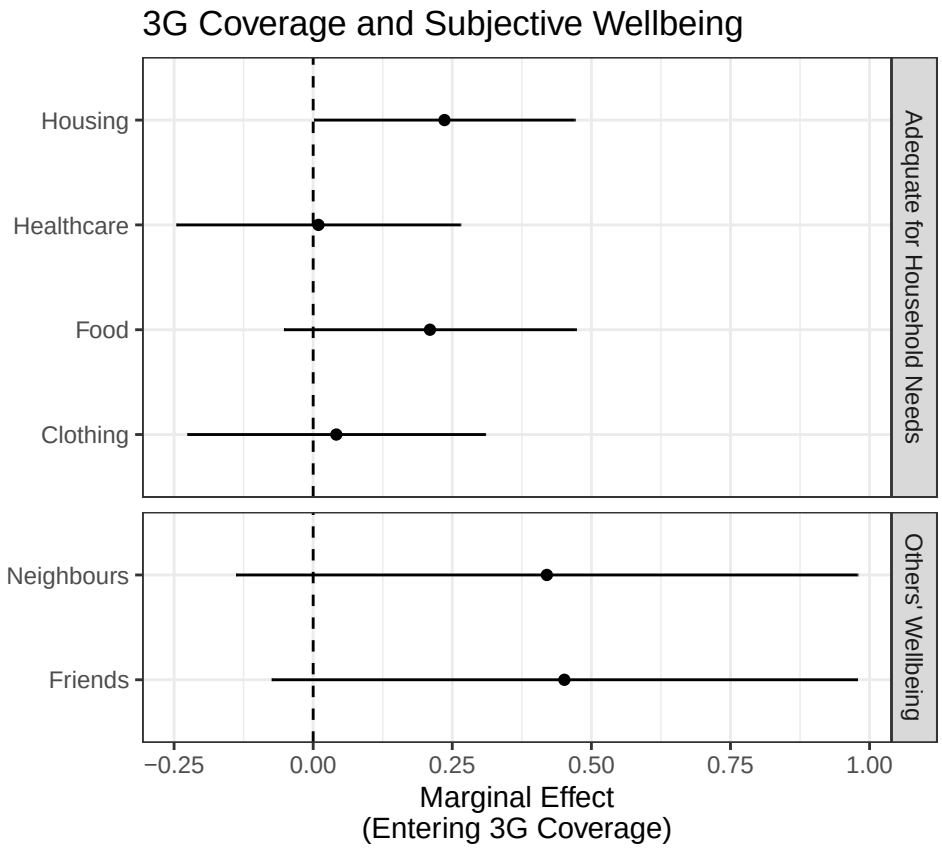

Figure 8: 3G internet and subjective wellbeing. Difference-in-difference estimates at the household level, for rural respondents in the 2016 and 2019 Malawi household panel survey with 95% confidence intervals. The results suggest that households inside coverage feel better off with respect to housing and food security after entering coverage. Moreover, respondents perceive their friends and neighbours to have gotten slightly wealthier. For detailed results, see Table 7 in the supplementary materials.

On balance, these results provide evidence that the expansion of 3G internet in Malawi, taking place shortly before the 2019 election, had tangible effects on labour market

[17] One nuance to this story is the relationship between coverage and subjective perceptions of income. For both coverage and paid work, there is no effect on respondents' direct perceptions of their own income. However, there is reason to believe this is likely an artefact of reporting bias, rather than a true lack of effect. Firstly, while subjective questions about food, housing and healthcare are all addressed in terms of "adequacy," the income questions are instead worded in a more convoluted manner. Respondents must either place themselves on a 6-point scale from poor to rich, or consider whether their income allows them to save money after meeting their expenses or instead need to borrow. Since the income levels of affected households are still very low, relatively speaking, it is unlikely that there would be further room for saving on top of this. And it is also not guaranteed that such households would be able to access credit markets in times of downturn. So how respondents interpret and answer this question might deviate slightly from a straightforward reflection of their pocketbook.

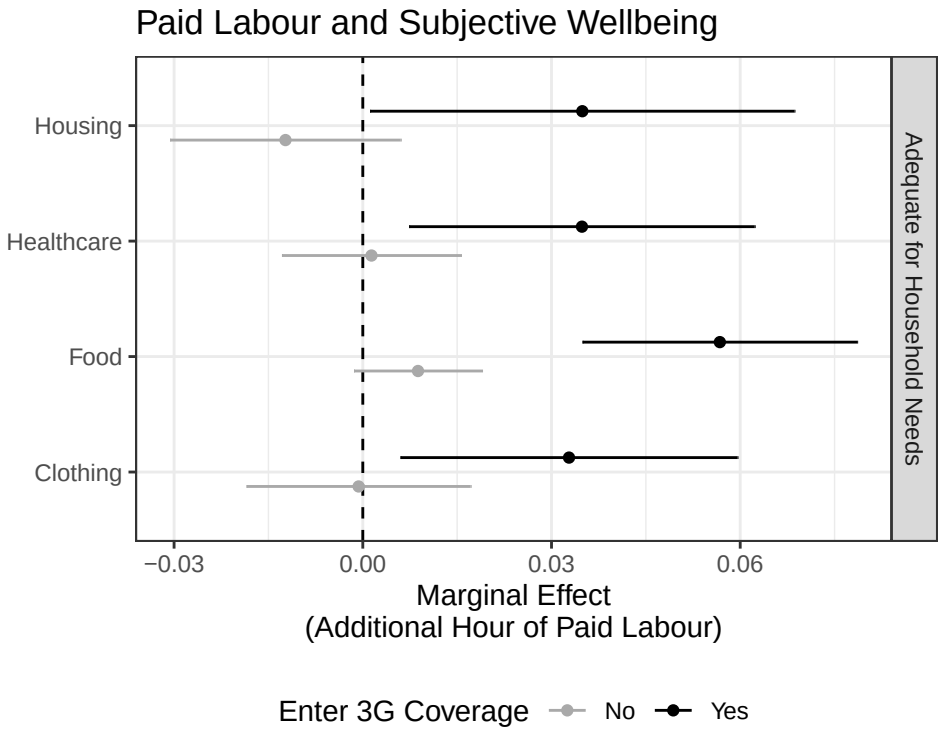

Figure 9: Paid labour and subjective wellbeing. Average marginal effects from panel estimates at the household level, for rural respondents in the 2016 and 2019 Malawi household panel survey, with 95% confidence intervals. The results suggest that households inside coverage feel better off as time spent in paid labour increases. For detailed results, see Table 8 in the supplementary materials.

participation and subjective household wellbeing. This is consistent with the idea that ICTs have positive material consequences. I now turn to the political effects that this may bring.

5.2 Household wealth and incumbent support

Do rural Malawians reward the government for positive changes in living conditions, changes which appear to arise from 3G coverage? To answer this question, I turn to the AfroBarometer social survey in Malawi, a nationally representative public opinion survey that asks respondents about their economic circumstances and political intentions. I take data from rounds 3 to 7 of the survey, focusing only on respondents in rural areas. This corresponds to around 7,000 individual interviews, taking place between 2005 and 2017.

Unlike the previous analyses, it is not possible to trace the direct impact of this particular 3G coverage expansion with AfroBarometer data. The latest publicly available survey round was fielded before the latest expansion began, and precise data about previous rollouts is unfortunately not available in the Collins Bartholomew dataset. Nonetheless, I present suggestive evidence that rural Malawians are electorally responsive to changes in their living conditions. Given a large literature suggests that such pocketbook considerations shape vote choice in Malawi and across Africa more widely, this analysis should be viewed as confirming something about which we already have strong priors.

I estimate a sequence of time-series cross-sectional models, controlling for district and survey-round fixed effects throughout. These specifications are descriptive, but nonetheless test whether AfroBarometer respondents behave in a manner consistent retrospective voting, and thus with the broader mechanism. I use questions about whether a respondent has "gone without" key basic goods or services in the past 12 months, alongside a general poverty index which averages across these. I measure incumbent support through respondents' trust in the President, evaluation of the President's performance, and intention to vote for them if an election were held. I once again subset for rural respondents, but also control for respondents' age, gender, ethnicity and education, each of which might shape vote choice in Malawi.

Figure 10 presents the results of this exercise. There are consistent negative results

across the board for trust and performance evaluations, indicating that respondents who go without basic goods and services are significantly less supportive of the incumbent. Likewise, the probability that a respondent intends to vote for the incumbent declines for three of the five measures, and for the aggregated poverty index. By symmetry, these results suggest that an *improvement* in living conditions is associated with a *rise* in incumbent support. And from analysing the household panel, we have seen that the provision of 3G coverage make such improvements more probable.

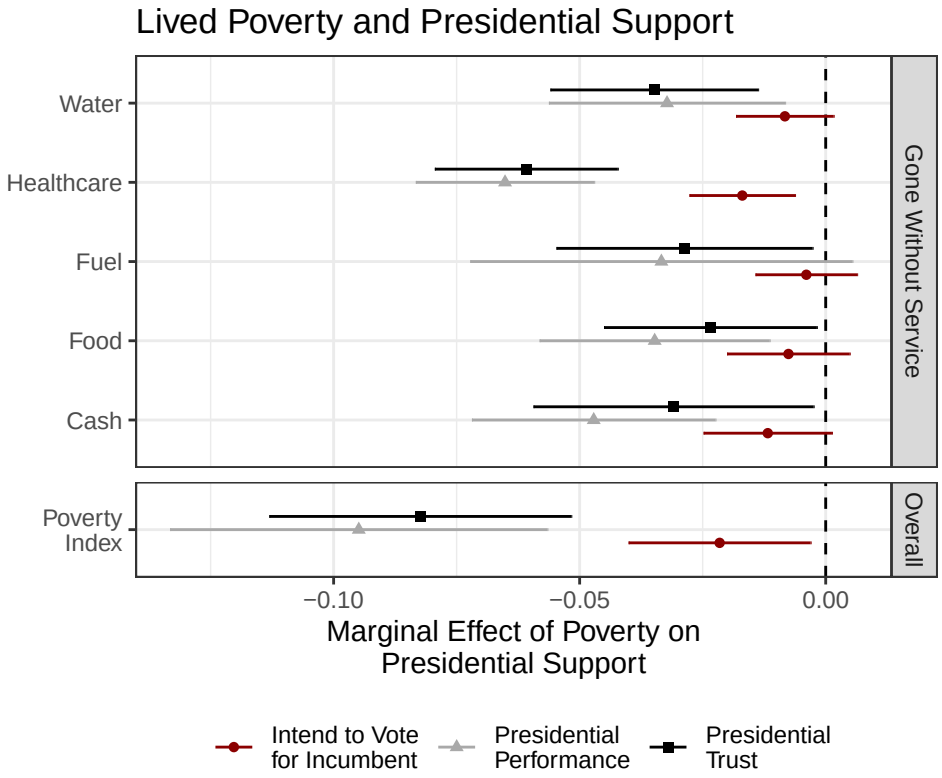

Figure 10: Lived poverty and Presidential support. Average marginal effects from TSCS models, with 95% confidence intervals, for rural respondents in rounds 3-7 of the AfroBarometer social survey in Malawi. The results indicate that worse (better) living conditions are associated with lower (greater) support for the incumbent President, consistent with the mechanism. For detailed results, see Tables 9-11 in the supplementary materials.

6 Discussion

Much ink has been spilled on the transformative effects of ICTs across the developing world, with significant attention being given to the role of information on political outcomes. This paper has advanced an additional, complementary, causal path. ICTs

can reshape subnational patterns of economic growth, bringing development to those localities touched by technological change. And, in turn, patterns of local development can have profound consequence for electoral politics and the quality of democracy.

This paper examined one indicator of democratic health: local variation election irregularities, focusing on the biased rejection of ballots. Existing studies have shown how ICTs can deter officials from irregular behaviour, either through polling station level experimental intervention (Callen and Long 2015; Callen et al. 2016), or macro-level analysis of mobile phone and internet coverage rollouts (Manacorda and Tesei 2020). While recognising the core findings of this large of body of research, this paper proposes an additional mechanism. As areas affected by technological change become wealthier, they become more supportive of the ruling party. And this incentivises officials to behave more or less fairly, based on their own partisan biases.

I tested this argument in Malawi, a new democracy with meaningful elections and handovers of power, but with significant experience of ballot irregularities and accusations of fraud. The analysis concentrated the 2019 election, which was eventually overturned by the supreme court, in a context of expanding 3G internet coverage into remote rural areas. Consistent with the argument, ballot rejections show signs of partisan manipulation between the country's regions, with 3G having heterogeneous effects in government and opposition strongholds. I then use household panel and public opinion surveys to find evidence supportive of the wider mechanism: coverage facilitates household-level improvements in living standards, and better living standards are associated with higher incumbent support.

In combining these insights together, the paper makes a series of contributions to the literature on election integrity, ICTs, and the politics of technological change.

First, the paper develops existing work on ICTs' political effects by moving beyond an overbearing focus on monitoring as a causal mechanism. While monitoring clearly works, it is unclear how often it happens *organically*, outside deliberate experimental intervention. Typical mobile phone users are unlikely to take pictures of polling station operations, and arranging protests in sparsely populated rural areas seems unlikely, as does the perceived threat this poses to officials. In contrast, a development-oriented approach concentrates on *structural* changes in the economy and electoral support. While this particular application is novel, the general framework is not – macro-historical scholars of technological change have long recognised the political consequences of

technology's distributional effects (Schumpeter 1942).

Second, the paper advances a renewed focus on the subnational variation in the quality of democracy. Earlier work saw regime type as relevant only at the country level, largely a function of national economic development (Lipset 1959). But development, society and politics are never uniform, even within a state's borders. Scholars have begun filling this gap by examining considerable local variation in election quality (Behrend and Whitehead 2016), corruption (Libman and Kozlov 2013), and even accountability outside formal elections (Tsai 2007). This paper contributes to such efforts, showcasing how 3G coverage has heterogeneous effects, across ruling and opposition party strongholds, within a single country case.

Lastly, the empirical analysis presented makes use of considerably fine-grained data sources, from polling-station level election results through to precise local data on mobile internet coverage. This level of spatial specificity remains rare in the analysis of political behaviour (Ichino, Williams, and Wibbels 2018), and enables more precise, meso-level research questions to be subjected to rigorous empirical test. Using such granular data also opens up multiple identification strategies, distilling greater confidence in the results more broadly.

With these contributions in mind, the research has a series of implications for existing theory. First, while a development-oriented explanation of election quality is not totally inconsistent with a monitoring based one, it suggests that generalising the results of monitoring frameworks requires care. ICTs clearly do diminish the cost of information transfer, but this will only lead to political action in certain circumstances. In urban areas, for instance, the threat of collective action is much more credible (Fox and Bell 2016), and plausibly more likely to drive the behaviour of election officials. But in peripheral, rural regions, it seems less likely to drive *aggregate* results. And in opposition dominated areas, where officials are biased against the government, ICTs may have the *opposite* effects than those stipulated by monitoring accounts. This research offers a tentative explanation why.

Another implication of a development-oriented account is that the impact of ICTs might be time-limited. In the early stages of coverage rollouts, the local economic benefits are likely to be largest (Aker and Mbiti 2010; Mbiti and Blumenstock 2015), but this material impact of coverage surely diminishes over time. As affected areas settle into new economic equilibria, it seems logical that systematic changes in electoral behaviour

become less important. And at this stage other factors, like the informational effects of ICTs, might become more important. This nuance is absent from many monitoring accounts, which assume that ICTs' effects on information and collective action will be more long-lasting. For policymakers, this divergence might be consequential.

On balance, this paper adds new theoretical layers to a pre-existing empirical result. ICTs can increase the quality of elections, but only in parts of the country which are already most supportive of the government. The paper uses a series of empirical tests in Malawi to support this explanation, using polling booth measures of ballot rejection and proprietary maps of 3G internet coverage. Future research should consider how this framework travels to other contexts, alongside considering the likely consequences of ICT-driven development on other electoral outcomes. But, for the time being, the paper offers theory and evidence that carries implications for students of ICTs' multifaceted political effects.

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