University of
St Andrews

School of Economics and Finance Discussion Papers

Aid and Growth in Malawi

Daniel Chris Khomba and Alex Trew

School of Economics and Finance
Online Discussion Paper Series
issn 2055-303X
http://ideas.repec.org/s/san/wpecon.html
info: econ@st-andrews.ac.uk

School of Economics and Finance Discussion Paper No. 1612
4 Nov 2016 (revised 1 Feb 2019)
JEL Classification: F35, O19, O55, R11
Keywords: Foreign aid, economic development, favoritism

Aid and Local Growth in Malawi*

Daniel Chris Khomba† and Alex Trew‡

February 1, 2019

Abstract

We study the local impact of foreign aid to constituencies and districts in Malawi over the period 1999–2013 using a highly detailed new aid database that includes annual disbursements at each project location. First, we show using household panel surveys that growth in light density is a good proxy for growth in per capita consumption. Second, we introduce a new political dataset that permits novel instrumental variables. Using two instruments, together or separately, we find a consistent, robust and quantitatively significant role for aid in causing growth in light density. Constituency-level regressions point to a larger effect than at district level, suggesting that aid causes some relocation of activity across space but not enough to make the net effect zero. The impact on growth peaks after two to three years but then falls to zero, implying that foreign aid has a level effect on incomes but does not stimulate sustained growth. Bilateral aid appears to be better in causing growth than multilateral aid. Aid delivered as a grant has an impact while that given as a loan does not.

JEL Classifications: F35, O19, O55, R11.
Keywords: Foreign aid, economic development, favoritism.

*We are grateful to Nicholas Crafts, Nathalie Ferrière, Stephan Heblich, Margaret Leighton, Bradley Parks, Luigi Pascali, Jon Temple, Jessica Wells and seminar participants at St Andrews, the College of William & Mary and at the 2017 CSAE conference for helpful comments and discussion. Remaining errors belong to the authors. Khomba thanks the University of St. Andrews for PhD funding through a 600th Year Celebration Scholarship.

†School of Economics and Finance, University of St. Andrews, Email: dck2@st-andrews.ac.uk.

‡For correspondence: School of Economics and Finance, University of St. Andrews, St. Andrews, Fife, UK, KY16 9AJ, Tel: +44(0)1334 461950. Email: alex.trew@st-andrews.ac.uk.

1 Introduction

Evidence to support the hypothesis that development assistance stimulates economic growth has been limited but growing over the last ten years.[1] The search for a causal role for aid at a country level has long been bedevilled by problems of identification (see Qian, 2015). Since the allocation of aid can be related to the growth rate of the recipient it is necessary to isolate exogenous variation in aid to establish a causal connection. Recent country-level contributions, such as Galiani et al. (2017), have found an economically and statistically significant role for aid in causing growth.

Aid is not uniformly distributed within a recipient country, however. Given the importance of urbanization and industrialization to growth, it could be informative to examine the disaggregated aid disbursement pattern and the spatially proximate consequences for growth. Recent efforts to use regional instruments (Dreher and Lohmann, 2015) have found limited evidence of a any causal effect on regional growth as measured by nighttime light data. That aid matters at a national level, but apparently not at a regional level, presents a puzzle.

In this paper we evaluate the effectiveness of aid flows to different regions (both parliamentary constituencies and administrative districts) in Malawi over the period 2000–2013. We use two determinants of the internal distribution of development aid[2] that are based on the political, institutional and cultural environment in Malawi. Our instruments exploit the Presidential powers to influence the disbursement of the Malawian development budget. In general, one concern might be that this President-influenced spending carries with it much more than foreign aid. However, in Malawi, foreign aid comprises nearly three quarters of the discretionary budget over the period studied here. In district-level regressions, we can also control for overall public spending and still find a significant, causal role for aid. We can thus be confident that growth effects generated by the discretion exercised by the President is primarily due to the internal variation in foreign aid flows. Our first instrument is a variable for *ethnic affinity* that is measured as the pro-

[1] See, for example, Boone (1996), Easterly et al. (2004), Rajan and Subramanian (2008), Doucouliagos and Paldam (2009), Dalgaard and Hansen (2010), Arndt et al. (2010), Dreher and Lohmann (2015).

[2] Throughout, by 'aid' we refer to non-humanitarian/food aid.

portion of a constituency or district population that is co-ethnic with the president. One concern with this instrument might be that the ethnicity of the President is related to those areas that anticipate future growth and so vote for a co-ethnic President; we show using Malawian electoral records that there is no significant voting along ethnic lines. The second instrument is *political switching* measured as a dummy equal to one if the Member of Parliament (MPs) in a constituency defects to join the party of the ruling President. In district level regressions, this is the share of the district's MPs that defect. As we argue below, the likelihood of defection is unrelated to expected future growth. Using each of these instruments, and both combined, we find economically and statistically significant evidence on the effectiveness of aid in causing growth (as proxied by the log change in nighttime light intensity which, as we show using household surveys, is strongly correlated with the growth of household consumption). The growth impact of aid is quantitatively significant and robust to local and year fixed effects, as well as a number of time-varying controls. We show that the effect on growth is hump-shaped (with a peak at a lag of two to three years), declining to zero over time. Aid for agriculture and education projects is the most beneficial while multilateral aid appears to be less effective than bilateral aid.

Our use of these instruments is related to recent work on political favoritism. Hodler and Raschky (2014) document the existence of regional favoritism in 126 countries. That study finds a significant effect of a leader's birthplace on the log of the average lighttime night in a region. It also finds a positive interaction between aid and birthplace, which Hodler and Raschky interpret as aid exacerbating the extent of favouritism. De Luca et al. (2018) shows just how significant the role of co-ethnicity is in the allocation of public funds in countries around the world. There are a number of difficulties in using favoritism to instrument for aid, however. First, in many countries the aid budget is only a small portion of the total discretionary budget being influenced by the political elite. Favoritism may thus capture the allocation of non-aid spending and bias the measured effect of aid on growth. Second, regions that vote for a particular leader may do so with the expectation of returns – co-ethnic support for a President may be on the back of explicit campaign promises of post-election investment. Third, using birthplace of the leader alone limits the spatial and time variation of the possible instrument in countries

where Presidents can remain incumbent for extended periods.

A number of features of Malawi over the period 2000–2013 help us address these concerns. First, aid comprises a substantial portion of the budget controlled by the President. Over our period of study, aid is 73% of development expenditures in Malawi.[3] As we argue below, non-development expenditures are not subject to the same Presidential interference. Second, we show that votes in Malawian elections are not historically along ethnic lines. Third, the political environment over our study period is particularly volatile with three different Presidents and three different ruling parties. As a result, we have substantial variation over time in both of our instruments.

This study makes use of two key datasets. The first is of sub-national allocation of foreign aid projects which comes from Malawi's Aid Management Platform (AMP). AMP contains 623 different projects from 43 different donors comprising US$7.1 billion in aid (which is 82% of the total over our period). The AMP was initially based on AidData (see Peratsakis et al., 2012), since it was created using data collected during the geo-coding exercise conducted in conjunction with AidData. A benefit of using the AMP is that it contains annual figures (commitments and disbursements) as well as the planned implementation period as per the project contract. AMP data also includes information on the project intention (i.e., support of agriculture, health or education) which allows us to disentangle the effects of aid. The data also takes into account project extensions or modifications (to, for example, project length or locations). We thus have an exceptionally high level of information on actual annual disbursements of aid. The second set of data is nighttime light data which is used to proxy for economic activity. There is a growing literature that finds nighttime light images can be used as a proxy for output growth and correlate well with other GDP-based measures of economic growth.[4] For Malawi in particular, we use the World Bank's Integrated Household Surveys to show that there is a high correlation between district-level growth in average real annual household consumption and district-level growth in light density. In addition to these data, we use district and year fixed effects as well as employing a wide range of district-level controls,

[3]Data from Ministry of Finance's annual Financial Statements.

[4]See Henderson et al. (2012), Michalopoulos and Papaioannou (2013), Lowe (2014) and Storeygard (2014).

including population density, non-development public expenditure, the poverty rate and rainfall. We also control for a variety of measures of development need, such as gross primary school enrolment, the number of classroom buildings, life expectancy, and infant mortality as well as the number of people in a district that are food insecure.

Our contribution is related to the existing body of literature on aid effectiveness. After the early work of Boone (1996), cross-country studies have used instruments such as population size (Burnside and Dollar, 2000; Rajan and Subramanian, 2008) or bilateral relationships (Bjørnskov, 2013). However, these approaches suffer from possibly direct effects on growth (see Bazzi and Clemens, 2009; Dreher et al., 2013). Temple and Van de Sijpe (2017) studies the consequences of aid for macroeconomic ratios. They find that aid increases consumption and has an impact on investment with a lag. Galiani et al. (2017) uses a convincingly excludable instrument and identifies a sizeable impact of aid on real per capita growth. Studies at a regional level have found mixed evidence of a causal effect of aid on growth. To address causality, Dreher and Lohmann (2015) use an interaction between a country's crossing of the IDA threshold and a measure of the region's historical probability of receiving aid (see Nunn and Qian, 2013). Dreher and Lohmann find no effect of aid when using this instrumental variable. Dreher et al. (2016), in contrast, does find a role for aid in causing growth at the regional level of Chinese aid flows when using an interaction with Chinese steel production as instrumental variable. Dreher et al. (forthcoming) find that the effect of short-term political favoritism at a country level reduces the effectiveness of aid. Our estimates of the effect of aid may be lower bounds for the true causal role played by aid.

There are recent papers that consider the impact of aid in Malawian regions. Rajlakshmi and Becker (2015) investigates the allocation and effectiveness of geo-coded aid projects from 30 agencies over 2004-2011. They find that aid reduces disease severity and diarrhoea incidence while it also increases school enrolment. Dionne et al. (2013) also use co-ethnicity to understand the allocation of aid across districts. In their study, aid has a limited impact on health and education outcomes.

Our study is also related to the literature on the ethnic and political distribution of resources in African countries. Posner (2005), Wrong (2009), Francois et al. (2015) and

Hodler and Raschky (2014) find evidence for the importance of ethnicity in the distribution of resources (including development aid). A growing literature following Alesina and Dollar (2000) has found a role for political influence in both the distribution of aid and in diminishing its effectiveness in generating development (see, for example, Dunning, 2004; Heady, 2008; and, Jablonski, 2014). We use these insights in the particular context of Malawi to motivate our instruments.

The rest of this paper is organized as follows. We discuss the Malawian political and economic context in Section 2. In Section 3 we introduce the data and develop our empirical strategy in section 4. Section 5 presents our main results first at the level of 193 constituencies and then at the level of the 28 administrative districts. Constituency regressions permit us to cluster standard errors at the level of the district, while district regressions allow us to use a wider set of controls. Section 6 considers the effect of aid by project type and investigates the dynamic effects of aid. Finally, Section 7 offers some concluding remarks.

2 Malawi

Malawi is a landlocked country in South Eastern Africa with a population in 2015 of 17.2 million (up from 3.6 million in 1960). With few natural resources, 85% of its population is rural and relies upon small-scale subsistence farming of the staple food (maize). Over 29% of GDP comes through exports and over half of that export revenue comes from one crop (tobacco). Malawi has historically suffered from high poverty, poor health outcomes and volatile growth. Nearly half (47.8%) of children under five years of age are malnourished according to stunting data (the average for sub-Saharan Africa is 39.9%. Based on figures from 2010, 70.9% of the population live below $1.90 a day (2011 PPP).[5] The 2015 United Nations Human Development Index (HDI) ranked Malawi 173rd out of 186 countries.

[5]Data from Malawi National Statistical Office (NSO), World Bank, and the Human Development Report (2015).

Foreign Aid

Given the low tax base, and the susceptibility to domestic supply and international demand shocks, foreign aid has constituted a significant proportion of government expenditures. Over 40 multilateral and bilateral development partners[6] have contributed an average 40% of the national budget over the last decade (Malawi Government (2011)). Figure 1 depicts ODA[7] per capita (panel a) and aid as a share of GNI (panel b) for Malawi against the average for Sub-Sahara Africa (SSA) and the average for Low Income Countries (as defined by the World Bank for the World Development Indicators). As can be seen, the per capita trend in aid flow to Malawi has followed that to other LICs but, since it is one of the poorest, aid as a share of income is relatively high. The majority of aid goes to health, education, agriculture and governance. Over the period of study, 8% of assistance has been given as humanitarian (non-development) aid.

Politics and spending

Malawi is divided into 28 administrative districts with the capital in Lilongwe. Following independence from British colonial administration in 1965, Malawi was for nearly three decades a one-party State. Since 1993, Malawi has been a multi-party democracy with a Parliament and President elected every five years. As can be seen in Figure 2, elections have regularly resulted in a change of President and party. However, as typical in many African countries, a 'Big Man' syndrome persists in Malawi – the President has significant discretionary power and tends to favour a group of trusted co-ethnics (see Francois et al., 2012). Some of the resources of the State are the patronage of this powerful ruler. In a country without any notable natural resources, state resources in Malawi means control over bureaucratic positions, powers to allocate rents (including foreign aid), public services and determine policies and their beneficiaries.

Important for the purposes of this paper is the nature of the political system as it relates to control of expenditure. Public spending is divided into the recurrent budget

[6]Among these are USAID, the World Bank, the Global Fund (to fight HIV/AIDS, malaria and tuberculosis), the European Union (EU), and, more recently, China.

[7]ODA is technically the same as development aid, as classified by OECD. It excludes aid to non-governmental organisations and charitable institutions. It covers all the aid disbursed to governments.

and the development budget. As we describe below, the Malawian development budget is that portion of the public spending that is under the influence of the President and this development budget is three quarters development assistance from overseas.

3 Data

This study uses data available over the period 1999 to 2013. There are 193 constituencies and 28 administrative districts in Malawi (see the left panel of Figure 3).[8] In most specifications we omit those constituencies or districts that were recently formed or split.[9] Further the two major cities of Lilongwe (the capital city) and Blantyre are omitted from most estimations. In constituency regressions we also omit each district's Boma (the constituency in the district that hosts administrative office).

Data on projects financed by foreign aid is from the Aid Management Platform (AMP), managed at the Ministry of Finance (MoF) in Malawi. The AMP is the government's main tool for tracking and reporting progress of aid-funded activities in Malawi and began with AidData's Malawi Geocoding Project which was the first effort to compile comprehensive geocoded data of all donor activities in a single recipient country in Africa. Based on information reported by both donors and the Malawi Government, the AMP contains geocoded data on projects from over 40 donor agencies covering 623 projects across 706 project locations. These projects total $7.1 billion (82% of total foreign aid to Malawi between 2000 and 2013). Figure 3 (right panel) shows a map of Malawi with the geocoded projects. The AMP data disaggregates cumulative project totals into annual commitments and actual disbursements of each project in a particular district. For this study, we use actual disbursement figures. Those projects in the AMP without location information have been excluded, reducing the number of projects used in this study to 593 projects.

To proxy for economic growth we use nighttime light data.[10] Geographers (Elvidge

[8]Table 1 gives all data and sources used. Table 2 lists all the districts in Malawi.

[9]Neno and Likoma districts were formed after splitting from Mwanza and Nkhatabay districts respectively. For these new districts, some data on most of the variables is missing not because they are not necessarily reported, but rather because for most of the years under study they were still being reported as part of the districts they were split from. Thus they are entirely excluded but they are subsumed as part of the parent districts.

[10]The light dataset is available at the National Geophysical Data Center's website: `http://ngdc.`

et al., 1997; Sutton et al., 2007) and ecologists (Doll et al., 2006) first used light density to study urbanization. Chen and Nordhaus (2011) and Henderson et al. (2012) subsequently showed that light intensity at night is a good proxy for local economic activity. By using luminosity, we have reliable data at high spatial resolution for those countries in which data availability is otherwise limited. Among more recent examples of its use are Michalopoulos and Papaioannou (2013), which studies development in Africa, and the aforementioned Hodler and Raschky (2014). We use the light data with intercalibration correction for sensor degration and orbital changes (see Elvidge et al., 2014).

A further advantage of basing our study on Malawian data is that we can check our proxy for development using the World Bank Living Standards Measurement Study in the years 2010, 2011 and 2013. The Integrated Household Surveys contain a great deal of information including real annual household consumption. In Table 3 we report correlations between the log level of light density and the district level average of the log level real annual consumption per capita and per household. The correlation is high, between 52 and 72%, and consistent across years. Moreover, the correlation between average growth in real consumption and growth in light density is just as strong. The correlation between the growth in light density and the growth in per capita consumption is 0.53 over the period 2010–13.

Figure 4 depicts luminosity at the pixel level for Malawi in 1999 and 2010 against the district borders.[11] For analysis in this paper, we calculate average light density at the constituency or district level (average light intensity per square kilometer) in each year over the period 1999 to 2013.

At constituency level, we use a number of additional controls including the log of population and the poverty rate from the National Statistic Office (NSO) census reports. Data on party affiliations of Members of Parliament, as well as list of Cabinet Ministers, is from Parliamentary Hansards found at the Malawi National Assembly library. Rainfall data is from meteorological reports provided by the 22 meteorological stations that form the weather network in Malawi. District-level regressions permit a wider range of controls.

noaa.gov/eog/dmsp/downloadV4composites.html.

[11]Maps for administrative districts are downloaded from DIVA-GIS, available at http://www.diva-gis.org/gdata

We include data on local public spending excludes aid (since aid is managed by central government Ministries), infant mortality, life expectancy and rate of food insecurity are from various reports from the NSO. Education data (gross primary enrolment and number of primary school classroom buildings) is from the Ministry of Education, Science and Technology. Table 1 gives a summary of the data used in the analysis and their sources while Table 4 shows descriptive statistics of the variables in the baseline sample.

4 Empirical strategy

We wish to estimate a light density growth regression of the following form,

$$\Delta LD_{i,t} = \beta_0 + \beta_1 LD_{i,t-1} + \beta_2 Aid_{i,t-1} + \mathbf{X}'_{i,t-1}\boldsymbol{\beta} + \mu_i + \gamma_t + \varepsilon_{i,t} \tag{1}$$

where $LD_{i,t}$ is log light density in constituency/district i at period t, $\Delta LD_{i,t} = LD_{i,t} - LD_{i,t-1}$, $Aid_{i,t}$ is the log of aid disbursements, $\mathbf{X}$ is a vector of control variables and μ_i and γ_t are constituency/district and time fixed effects. Robust standard errors are clustered at the level of the district in constituency regressions, and at the level of the three regions in district level regressions.

A first concern with the specification in equation (1) is that aid disbursements are not random. In particular, we may expect that development assistance is given to those areas with the lowest expected growth, or those that have suffered negative shocks in the past. Conversely, it may be that, particularly *within* a country, assistance is given to those areas that show the greatest potential for generating growth. Second, we may face attenuation bias since we are using an imperfect proxy for economic activity. Third, there may be unobserved variables related to both aid and development, that make the role of aid appear significant.

To account for these concerns we employ two novel instruments that are related to the discretionary powers of the President to favour those in his/her inner circle but are not, we argue, related to development through other channels. We thus use our instruments in the following system,

$$\Delta LD_{i,t} = \beta_0 + \beta_1 \widehat{Aid}_{i,t-1} + \beta_2 LD_{i,t-1} + \mathbf{X}'_{i,t-1}\boldsymbol{\beta} + \mu_i + \gamma_t + \varepsilon_{i,t}, \tag{2}$$

$$Aid_{i,t} = \alpha_0 + \alpha_1 z_{i,t} + \alpha_2 LD_{i,t-1} + \mathbf{X}'_{i,t}\boldsymbol{\alpha} + \mu_i + \gamma_t + \nu_{i,t}, \tag{3}$$

where z is an instrumental variable. For the instrument to be valid, it must be relevant ($\alpha_1 \neq 0$) and exogenous ($cov(z_{i,t}, \varepsilon_{i,t}) = 0$).

We discuss a number of potential concerns about the validity of each of these instruments below. One issue that is common to each regards the nature of the discretionary powers that the President has. It may be that the President allocates a large portion of State resources in addition to foreign assistance. In many countries, this would be a valid concern but, by focusing on Malawi, it is less problematic. The Malawian Development Budget is that portion of the public spending that is under the most influence of the President. Other departmental expenditure is comprised of recurrent expenses such as salaries, interest payments on public debt, procurement of goods and services, payment of pensions and gratuities, etc. There is limited scope for the President to exert discretion on the allocation of these budgets across districts. The allocation of transfers to districts is determined by the National Local Government Finance Committee (NLGFC) – a quasi-governmental institution mandated with effective mobilization, equitable distribution and efficient utilisation of financial resources in local councils. Finally, in Malawi, the Development Budget is 73% foreign aid over the period of study.

Ethnic affinity as instrument

Our first instrument is the proportion of the population in a district or constituency that is co-ethnic with the sitting President. Malawi people are of Bantu origin and comprise many different ethnic groups. Malawi Human Rights Commission (2005) finds that there are about 15 ethnic groups in Malawi. The major ones are shown in Figure 5. The largest group, the Chewa people, make up 38.4% of Malawi's population and are mainly found in the center. As shown in Figure 2, over our study period the President is either Lomwe (17.6% of the population, mainly in the South) or Yao (13.5%, in the East).

The relevance condition requires that the instrument be a predictor of aid disbursements. There is already evidence that disproportionate amounts of aid are allocated to an incumbent President's district of birth, especially in Sub Saharan Africa. Franck and Rainer (2012) use data from 18 African countries over 50 years and find significant evidence of large and widespread ethnic favoritism in the allocation of aid resources. As an example of this in Malawi, Figure 6 shows district-level aid disbursements in Malawi under two Presidents of different ethnic origins. Despite the fact that President Bakili Muluzi received a majority of votes in districts in the Southern region, the Yao districts of Machinga (his birth district), Mangochi and Balaka are allocated disproportionately higher amounts of aid than any of the other districts. When President Bingu wa Munthalika of Lomwe origin was in office, and despite getting a bigger share of votes in the Yao districts than he got from his birth district, Figure 6 shows that the Lomwe districts of Thyolo, Mulanje and Phalombe received more aid than the Yao districts.

One concern with the exogeneity of this instrument relates to the connection between co-ethnic voting behavior. There is a large literature on the role of ethnicity in African voting behavior (see, for example, Posner, 2005). If districts supported Presidential candidates primarily along ethnic lines then a President's ethnicity ceases to be random – a district's vote is for the candidate that will send the aid their way. If it is the poorest districts that most vote along ethnic lines, then our instrument is not exogenous.

There is evidence against this clientelistic interpretation, however. Recent studies in Ghana (Lindberg and Morrison, 2008) and South Africa (Anyangwe, 2012) find no or very limited evidence that voting is subsumed in ethnicity. For Malawi, we report in Appendix Table 12 results from a regression of the vote share that a winning candidate received from each district in the 1999, 2004 and 2009 general elections on the proportion of the winning candidate's co-ethnics in a district. Ethnicity does not seem to affect the vote share that a candidate gets in the district, being found to be statistically insignificant. In contrast, party identification, a dummy variable that takes the value 1 if the winning President's party has a parliamentary majority in that district, or 0 otherwise, is statistically significant.

Finally, it is important to consider whether there are any other channels through which

ethnicity could affect the level of economic activity at the district level. For instance, it may be that the cultural practices of a particular ethnic group are more consistent with higher economic activity. To account for this possible channel, for each of the five largest ethnic groups we include a dummy variable equal to 1 if a given district has a majority of that ethnicity.

Political switching as instrument

Another determinant of aid distribution can be the desire of the incumbent President to consolidate their political base. There is evidence that aid is distributed towards electorally-strategic regions and away from opposition dominated regions (Briggs, 2012; Jablonski, 2014). Our second instrument is thus the proportion of Members of Parliament (MPs) in a district that defect from the political party with which they won the Parliamentary seat to the party of the ruling President. In constituency regressions this is a dummy variable (i.e., the proportion is 1 if the constituency MP defects).

Political affinity is often viewed in a similar way as ethnicity in African politics.[12] In this view, a leader is constrained in exercising full ethnic exclusion since doing so may not adequately sustain a coalition of support. In order to consolidate their political base, leaders look to co-opt other powerful elites, often from ethnic groups in regions distinct from their own. In Malawi, this co-opting often takes the form of defection ('crossing the floor') rather than the formation of cross-party coalition governments. As in many Sub-Saharan countries, once the President is in power the biggest barrier to total control is not having a majority representation in Parliament. Defection is induced by the promise of personal gains (i.e., public office) and a flow of aid to the defecting MP's region. Districts that gave the President only limited electoral support may now be favored with aid flows.

Crossing the floor comes with risk for the politician, however. First, Section 65 of the Malawi Constitution prohibits MPs from crossing the floor. This is intended to keep the composition of Parliament close to that determined by the vote. By crossing the floor, they risk their seats being declared vacant. Second, defection reduces the chances

[12]See Joseph (1987), Van de Walle (2007), Arriola (2009).

of being re-elected in the next general election. As discussed, party identification is key to voter behavior. By defecting, an MP is generally joining a party that does not have a stronghold in their own district. For example, of the 68 MPs that defected to the DPP in 2005, 35 MPs came from districts in the Central and Northern regions where the DPP did not have wide support. Of these, 32 seats were contested in the 2009 general elections for the DPP and 21 lost their seats.

Despite the possible costs of defection it has happened frequently in Malawi, especially over the period 2005 and 2012. The need to consolidate political power can emerge when coups threaten, when a sitting President dies or when the ruling political party is changed without an election. Table 5 provides the breakdown of the composition by party of Malawi's Parliament. The period of volatility since 2005 was the result of non-electoral events. In 2005, Dr Bingu wa Munthalika formed the Democratic Progressive Party (DPP), abandoning the United Democratic Front (UDF) on whose ticket he contested in the 2004 elections. The DPP became the ruling party and the UDF, which had won the 2004 elections, became part of the opposition. In 2011, the then Vice President Dr Joyce Banda formed a new party, the Peoples Party (PP), abandoning the DPP with which she was Dr wa Munthalika's running mate in 2009 elections. Upon Dr wa Munthalika's death in 2012, she assumed the presidency and her PP became the ruling party while the DPP moved to opposition.

An example of the impact of the reconstitution of parties on aid disbursement is the period from 2004–2005. When Dr wa Munthalika abandoned the party with which he was elected president in 2004 (UDF) to form his own DPP in 2005, the DPP initially had no MPs in Parliament and had difficulties in passing policies and legislations. Through inducing defections, the DPP managed to co-opt MPs particularly from the Northern districts (see figure 7). As can be seen in figure 6, from 2005 some of these Northern region districts received significantly more aid disbursement than before.

For this instrument to be valid, we require that the likelihood of an MP's defection is unrelated with future economic growth in the constituency they represent. The motivation to defect depends on the type of defector. Independent MPs are generally the first to be targeted by a power-consolidating leader. They are often easily swayed by the opportunity

to make quick and easy personal gains, though some may even be appointed into key positions. As the Table 5 shows, almost immediately after each election, the number of independent MPs reduce to rapidly to 0 in subsequent years (from 40 in 2004 and from 32 in 2009). Figure 7 shows that many of the newly DPP regions were formerly independent. A second type of defector is an influential, veteran MP that has already served for a long period. For these power brokers, where they lose their positions when the President changes, promise of re-appointment into the positions that accord them powers, and development assistance in their district, induces their switching of parties. A third type of defector is a member of a smaller or breakaway party. Table 4 shows that the number in 'Other' is generally nonzero in an election year but declines to zero once the winning party attracts them to defect. During 2004 election, National Democratic Alliance (NDA), which broke away from the UDF after a leadership dispute, won 9 seats and Peoples Progressive Movement (PPM) (another party formed from disputes) won 6 seats, however by 2005 when the DPP was formed and took power, they all defected and joined the new ruling party.

5 Main results

We present results first at the constituency level and then at district level. Regressions at constituency level benefit from a larger cross section and the ability to cluster standard errors at the district level but limits the set of control variables. District level regressions also permit a wider range of extensions, which we introduce in Section 6.

5.1 Constituency results

Table 6 reports results using both instruments at the constituency level. All regressions include constituency and year fixed effects with robust standard errors clustered at the level of the 24 districts. In Column 1 we report the OLS regression results using all controls. The OLS result with all controls suggests a positive and statistically significant connection between growth and the log of aid. Two-stage least squares results are in columns 2–7 with a stepwise addition of control variables. The statistical significance

of each instrument in the first stage regression is strong in all specifications. When we instrument for the log of aid using political switching and ethnic affinity, the size of the coefficient on aid increases and it is statistically significant at the 1% level across all specifications in Columns 2–7.

As we would expect, the coefficient on initial light density is negative and significant in all specifications, capturing a conditional convergence across districts. The log of population and the log of rainfall are positively related with light density growth. The poverty rate is not significant while a dummy for whether the constituency is represented by a minister is generally significant. The log of aid disbursements is highly statistically significant in all specifications.

Across all specifications, the Anderson-Rubin p-value is less than 0.01 and the F-statistic for instrument exclusion is greater than 10. The p-value of the Hansen J-statistic is between 0.71 and 0.85, so we fail to reject the over-identifying restriction across all specifications. Results from regressions using only the ethnic affinity instrument are in Appendix Table 13; that from using only the political switching instrument are in Appendix Table 14. Anderson-Rubin and KP statistics show that the instruments also perform strongly individually.

Our preferred constituency-level specification is that in Column 6 of Table 6. This implies that a 10% increase in aid disbursed to a constituency causes light density to increase by 6.22% per year. The magnitude of the effect is larger than that found in Galiani et al. (2017), although that study uses real GDP growth as a dependent variable. While some of the effect of the aid disbursement may be to re-allocate activity across space, the results from district-level regressions also support the finding that aid is causally important.

5.2 District results

Table 7 reports results using both instruments at the district level. In addition to the baseline controls used at the constituency level, we add the log of public spending since the discretionary power of the President may influence spending other than aid. Regressions

include district and year fixed effects. At the district level, the OLS regression with all controls (column 1) suggests a positive but statistically weak connection between growth and the log of aid.

Two-stage least squares results are in columns 2–9. The statistical significance of each instrument in the first stage regression is strong in all specifications. When we instrument for the log of aid using political switching and ethnic affinity, the size of the coefficient on aid increases and it is statistically significant at the 1% level across all specifications in Columns 2–9. The increase in the coefficient between OLS and 2SLS can be the result of measurement error. This is common to recent studies on aid and growth (including Dreher and Lohmann, 2015 and Galiani et al., forthcoming).

Public expenditure (excluding foreign aid) is insignificant, which is reassuring if we are concerned that an affect on growth may operate through a President's influence over non-development spending. Districts with greater population density grow faster, which is consistent with the literature on urbanization and development (see Desmet and Henderson, 2015). The log of rainfall appears to play no role in explaining variations in growth. Columns 3 and 4 add measures of education in districts. The log of the gross primary enrolment rate is statistically significant in most specifications. The coefficient on the number of classroom buildings is not statistically significant. Columns 5 and 6 add health outcome variables while Columns 7 adds a measure of agricultural security.

Across all specifications, the Anderson-Rubin p-value is less than 0.01 and the F-statistic for instrument exclusion is greater than 10. What is clear in the first stage results is that the political switching instrument is less statistically significant at the district level. This makes sense given we take the proportion of MPs that switch as our instrument; it also suggests that there is limited within-district correlation in the likelihood of switching. The p-value of the Hansen J-statistic is between 0.11 and 0.13, so we fail to reject the over-identifying restriction across all specifications. Results from regressions using only the ethnic affinity instrument are in Appendix Table 15; that from using only the political switching instrument are in Appendix Table 16. Anderson-Rubin and KP statistics show that the instruments also perform strongly individually.

Our preferred specification is that in Column 7 of Table 7. This implies that a 10% in-

crease in aid disbursed to a district causes light density to increase by 1.9% per year, which is smaller than in constituency regressions. The difference in the size of the coefficient may result from aid causing some movement of economic activity *across* constituencies *within* a district. Since the standard deviation of the log of aid is 1.1076, the effect of a one standard deviation increase in aid disbursement is to increase light density by 21.4%. The effect of aid on growth is, in absolute terms, quantitatively important for short-run growth.

6 Extensions

Our dataset contains detailed information on the disbursements in each year of each aid project, the type of project (agricultural, health and education) and the nature of the funding body (whether a loan or a grant; whether multilateral or bilateral donor). Moreover, one of the advantages of our identification strategy, is that it provides a way of isolating the variation in aid disbursement to different districts over time. We can thus look to understand impact of aid on growth over time.

Time lags

In a first extension, we look at the effect of aid on growth with a longer lag than one year. To do so, we estimate the following system,

$$\Delta_n LD_{i,t} = \beta_0 + \beta_1 \widehat{Aid}_{i,t-n} + \beta_2 LD_{i,t-n} + \mathbf{X}'_{i,t-n}\boldsymbol{\beta} + \mu_i + \gamma_t + \varepsilon_{i,t}, \tag{4}$$

$$Aid_{i,t-n} = \alpha_0 + \alpha_1 z_{i,t-n} + \alpha_2 LD_{i,t-n} + \mathbf{X}'_{i,t-n}\boldsymbol{\alpha} + \mu_i + \gamma_{i,t-n} + \nu_{i,t-n}, \tag{5}$$

where $\Delta_n LD_{i,t}$ denotes $LD_{i,t} - LD_{i,t-n}$ and $n > 1$. In other words, our estimate of β_1 captures the effect of aid in time $t - n$ on growth in light density over the subsequent n years.

In Table 8, we add lags of up to six years to the constituency specification from Table 6 (column 7). The point estimates for β_1 and 95% confidence intervals are depicted in Figure 8. The results suggest that the response of growth to an increase in aid flows is

increasing over time until a peak effect on growth in light density after two years since the aid was disbursed (that is, aid disbursed at $t-2$ having an impact on growth between $t-2$ and t). The effect declines thereafter, falling to close to zero at a lag of six years. Table 9 and Figure 9 depict a similar story at the district level, although in this case the (smaller) peak effect is seen after three years. Both the constituency and district results suggest that there are real gains to aid, but that the effect on growth disappears after four to six years. That is, aid appears to have a persistent effect on the level of light intensity, but not on its growth rate.

Project type

Some aid projects in the AMP include information on the targeted outcome for the funding. Table 10 shows results for those projects that go to agriculture, health and education (which together comprise 56% of total aid in the dataset). The performance of the instruments is mixed in some aspects, with limited strength in the first stage. The largest coefficient is on aid to agriculture which makes sense given the direct importance of agriculture for the Malawian economy. The growth impact of aid for education and health projects is lower, though it remains statistically significant at the 10% level.

Funding type

Table 11 reports results of the effect of aid on growth broken down into the type of funding, multilateral or bilateral, grant or loan. The instruments work well in each of these types of aid. Table 11 suggests that bilateral aid has a larger short-run impact on growth than multilateral aid. Individual countries, particularly China, have increased bilateral aid flows over recent years and these results suggest that the results from those projects in terms of growth have been successful. Moreover, grants have a greater impact than loans, suggesting that the expectation of future higher taxation may limit the contemporaneous effect of aid.

7 Concluding remarks

In focusing the disbursement of aid within one country, we have developed a new way of isolating the causal relationship between the flow of aid and the rate of growth. We have shown that there is a robust and qualitatively significant impact of aid on contemporaneous growth and a hump-shaped response up to two years after the initial disbursement. The difference between the constituency and district results suggest that aid causes a significant relocation of activity across space but that, nevertheless, the effect overall is positive.

The identification strategy we employ is particular to the political and institutional environment in Malawi. While there is evidence on the role of ethnicity (via birthplace) in other contexts, the instrument based on attraction of political defections could also be considered elsewhere. Malawi is among the poorest of the LICs, but the apparent success of aid in causing growth in this country suggests that some of the pessimism regarding aid effectiveness that has emanated out of the mixed empirical evidence in recent years may have been misplaced.

Further study of the consequences of aid using geographically disaggregated data, with particular attention to unbundling the different types of assistance, could significantly improve our understanding of the effectiveness of foreign aid.

References

Alesina, A. and Dollar, D. (2000). Who gives foreign aid to whom and why? *Journal of Economic Growth*, 5(1):33–63.

Anyangwe, C. (2012). Race and ethnicity: Voters's party preference in South African elections. *International Journal of African Renaissance Studies - Multi-, Inter- and Transdisciplinarity*, 7(2):38–58.

Arndt, C., Jones, S., and Tarp, F. (2010). Assessing foreign aid's long-run contribution to growth and development. *World Development*, 69:6–18.

Arriola, L. R. (2009). Patronage and political stability in Africa. *Comparative Political Studies*, 42(10):1339–1362.

Bazzi, S. and Clemens, M. A. (2013). Blunt instruments: Avoiding common pitfalls in identifying the causes of economic growth. *American Economic Journal: Macroeconomics*, 2(5):152–186.

Bjørnskov, C. (2013). Types of foreign aid. *University of Aarhus Working Papers*, (2013-08).

Boone, P. (1996). Politics and the effectiveness of foreign aid. *European Economic Review*, 40(2):289–329.

Briggs, R. C. (2012). 'Electrifying the base? Aid and incumbent advantage in Ghana'. *The Journal of Modern African Studies*, 50(04):603–624.

Burnside, C. and Dollar, D. (2000). Aid, policies, and growth. *American Economic Review*, 90(4):847–868.

Chen, X. and Nordhaus, W. (2011). Using luminosity data as a proxy for economic statistics. *The Proceedings of National Academy of Science*, 108(21).

Dalgaard, C.-J. and Hansen, H. (2010). Evaluating aid effectiveness in the aggregate: A critical assessment of the evidence.

De Luca, G., Hodler, R., Raschky, P. A., and Valsecchi, M. (2018). Ethnic favoritism: An axiom of politics? *Journal of Development Economics*, 132:115–29.

Desmet, K. and Henderson, J. V. (2015). 'The Geography of Development Within Countries'. Chapter 22 in Duranton, G., J.V. Henderson and W. Strange. *Handbook of Regional and Urban Economics*, Elsevier.

Dionne, K., Kramon, E., and Roberts, T. (2013). Aid effectiveness and allocation: Evidence from Malawi. *Paper Presentation at the ASA 2013 Annual Meeting*.

Doll, C. N., Muller, J.-P., and Morley, J. G. (2006). Mapping regional economic activity from night-time light satellite imagery. *Ecological Economics*, 57(1):75 – 92.

Doucouliagos, H. and Paldam, M. (2009). The aid effectiveness literature: The sad results of 40 years of research. *Journal of Economic Surveys*, 23(3):433–461.

Dreher, A., Eichgenauer, V., and Gehring, K. (Forthcoming). 'Geopolitics, Aid and Growth: The Impact of UN Security Council Membership on the Effectiveness of Aid'. *World Bank Economic Review*.

Dreher, A., Fuchs, A., Hodler, R., Parks, B. C., Raschky, P. A., and Tierney, M. J. (2016). Aid on Demand: African Leaders and the Geography of China's Foreign Assistance. AidData Working Paper 3.

Dreher, A., Klasen, S., Vreeland, J. R., and Werker, E. (2013). The costs of favoritism: Is politically driven aid less effective? *Economic Development and Cultural Change*, 62(1):157–191.

Dreher, A. and Lohmann, S. (2015). Aid and growth at the regional level. *Oxford Review of Economic Policy*, 31(3-4):420–446.

Dunning, T. (2004). Conditioning the effects of aid: Cold war politics, conditioning the effects of aid: Cold war politics, donor credibility and democracy in Africa. *International Organisation*, 58(2):409–423.

Easterly, W., Levine, R., and Roodman, D. (2004). New data, new doubts. *American Economic Review*, 94(3):774–780.

Elvidge, C. D., Hsu, F.-C., Baugh, K. E., and Ghosh, T. (2014). National trends in satellite-observed lighting 1992-2012. In Weng, Q., editor, *Global Urban Monitoring and Assessessment through Earth Observation*, chapter 6, pages 97–120. CRC Press: Taylor and Francis Group.

Elvidge, C. D., Kihn, E. A., Baugh, K. E., Kroehl, H., and Davis, E. (1997). Mapping city lights with nighttime data using dmsp operational linescan system data. *Photogrammetric Engineering and Remote Sensing*, 63:727–734.

Franck, R. and Rainer, I. (2012). Does the leader's ethnicity matter? ethnic favoritism, education, and health in Sub-Saharan Africa. *American Political Science Review*, 106(02):294–325.

Francois, P., Rainer, I., and Trebbi, F. (2015). How is power shared in Africa? *Econometrica*, 83(2).

Galiani, S., Knack, S., Xu, L. C., and Zou, B. (2017). The effect of aid on growth: Evidence from a quasi-experiment. *Journal of Economic Growth*, 22(1).

Heady, D. (2008). Geopolitics and the effect of foreign aid on economic growth, 1970-2001. *Journal of International Develeopment*, 20(2):161–180.

Henderson, J. V., Storeygard, A., and Weil, D. N. (2012). Measuring ecconomic growth from outer space. *American Economic Review*, 102(2):994–1028.

Hodler, R. and Raschky, P. A. (2014). Regional favoritism. *The Quarterly Journal of Economics*, 129(2):995–1033.

Jablonski, R. S. (2014). How aid targets votes: The impact of electoral incentives on foreign aid distribution. *World Politics*, 66(2):293–330.

Joseph, R. A. (1987). Democracy and prebendal politics in nigeria: The rise and fall of the second republic. *African Study Series*, 56.

Lindberg, S. I. and Morrison, M. K. C. (2008). Are African voters really ethnic or clientelistic? Survey evidence from Ghana. 123(1):95–122.

Lowe, M. (2014). Rail revival in Africa? the impact of privatization. *Joint RES-SPR Conference on Macroeconomic Challenges FacingLow-Income Countries: New Perspectives*.

Malawi Government (2011). Malawi aid atlas, 2011 fiscal year. Technical report.

Malawi Human Rights Commission (2005). Report on cultural practices in malawi. Technical report.

Michalopoulos, S. and Papaioannou, E. (2013). Pre-colonial ethnic institutions and contemporary African development. *Econometrica*, 81(1):113–152.

Nunn, N. and Qian, N. (2014). U.S. food aid and civil conflict. *American Economic Review*, 104(6):1630–1666.

Peratsakis, C., Powell, J., Findley, M., Baker, J., and Weaver, C. (2012). Geocoded Activity-Level Data from the Government of Malawi's Aid Management Platform. Washington D.C. AidData and the Robert S. Strauss Center for International Security and Law.

Posner, D. (2005). *Institutions and Ethnic Politics in Africa*. Cambridge University Press.

Qian, N. (2015). Making Progress on Foreign Aid. *Annual Review of Economics*, 7:277–308.

Rajan, R. G. and Subramanian, A. (2008). Aid and growth: What does the cross country evidence really show? *The Review of Economics and Statistics*, 90(4):643–665.

Rajlakshmi, D. and Becker, C. (2015). The Foreign Aid Effectiveness Debate: Evidence from Malawi. AidData Working Paper #6. Williamsburg, VA: AidData. Accessed at http://aiddata.org/working-papers.

Robinson, A. L. (2016). Internal Borders: Ethnic-based market segmentation in Malawi. *World Development*, 87(C):371–384.

Storeygard, A. (2014). Farther on down the road: Transport costs, trade and urban growth in Sub-Saharan Africa. (0781).

Sutton, P. C., Ghosh, T., and Elvidge, C. D. (2007). Estimation of Gross Domestic Product at sub-national scales using nighttime satellite imagery. *International Journal of Ecological Economics and Statistics*, 8(S07).

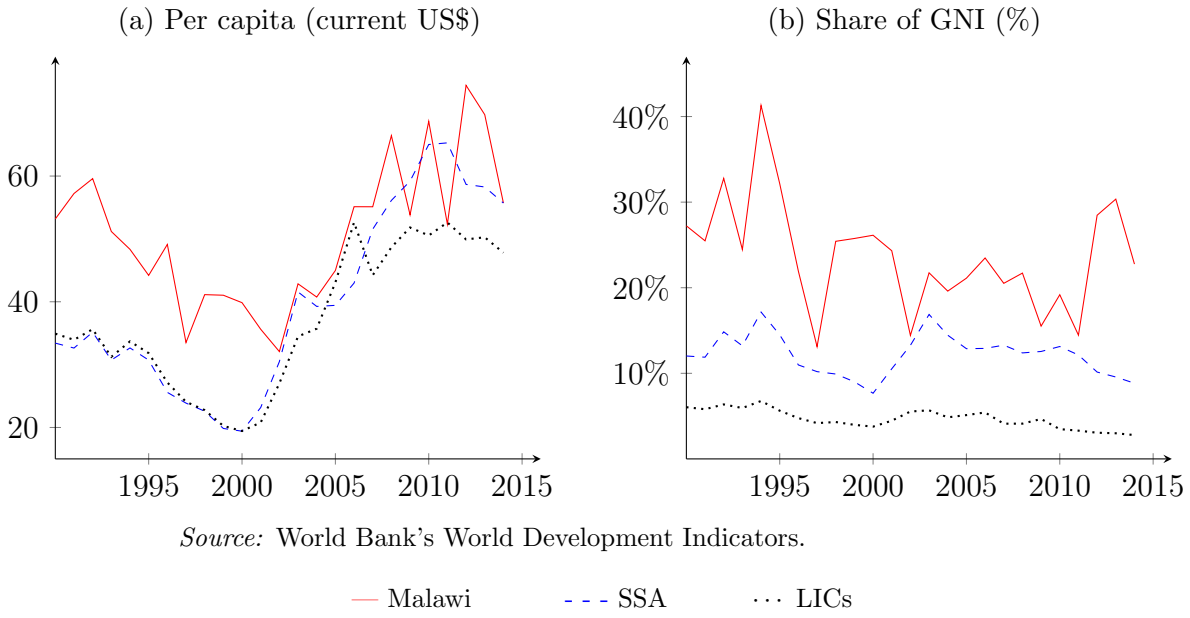
Temple, J. and Van de Sijpe, N. (2017). Foreign aid and domestic absorption. *Journal of International Economics*, 108:431–43.

Van de Walle, N. (2007). Meet the new boss, same as the old boss? the evolution of political clientelism in Africa. In Kischelt, H. and Wilkinson, S. I., editors, *Patrons, Clients and Policies: Patterns of Democratic Accountability and Political Competition*, pages 50–67. Cambridge University Press.

Wrong, M. (2009). *It's our turn to eat. The story of a Kenyan whistle-blower*. Harper Collins.

A Figures

Figure 1: Net aid to Malawi and other regions



Source: World Bank's World Development Indicators.

Figure 2: Timeline of recent Malawian politics

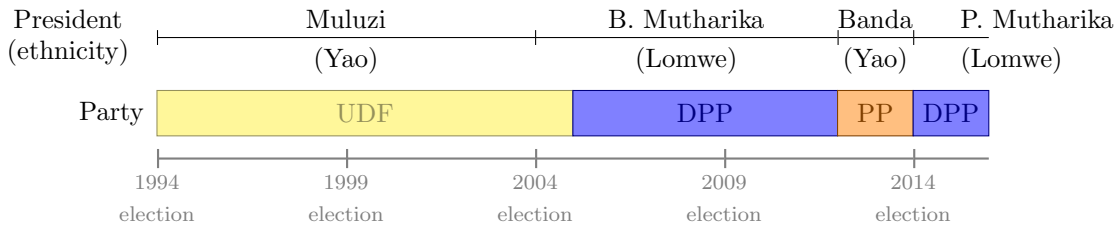


Figure 3: Boundaries (l) and locations of geocoded projects (r)

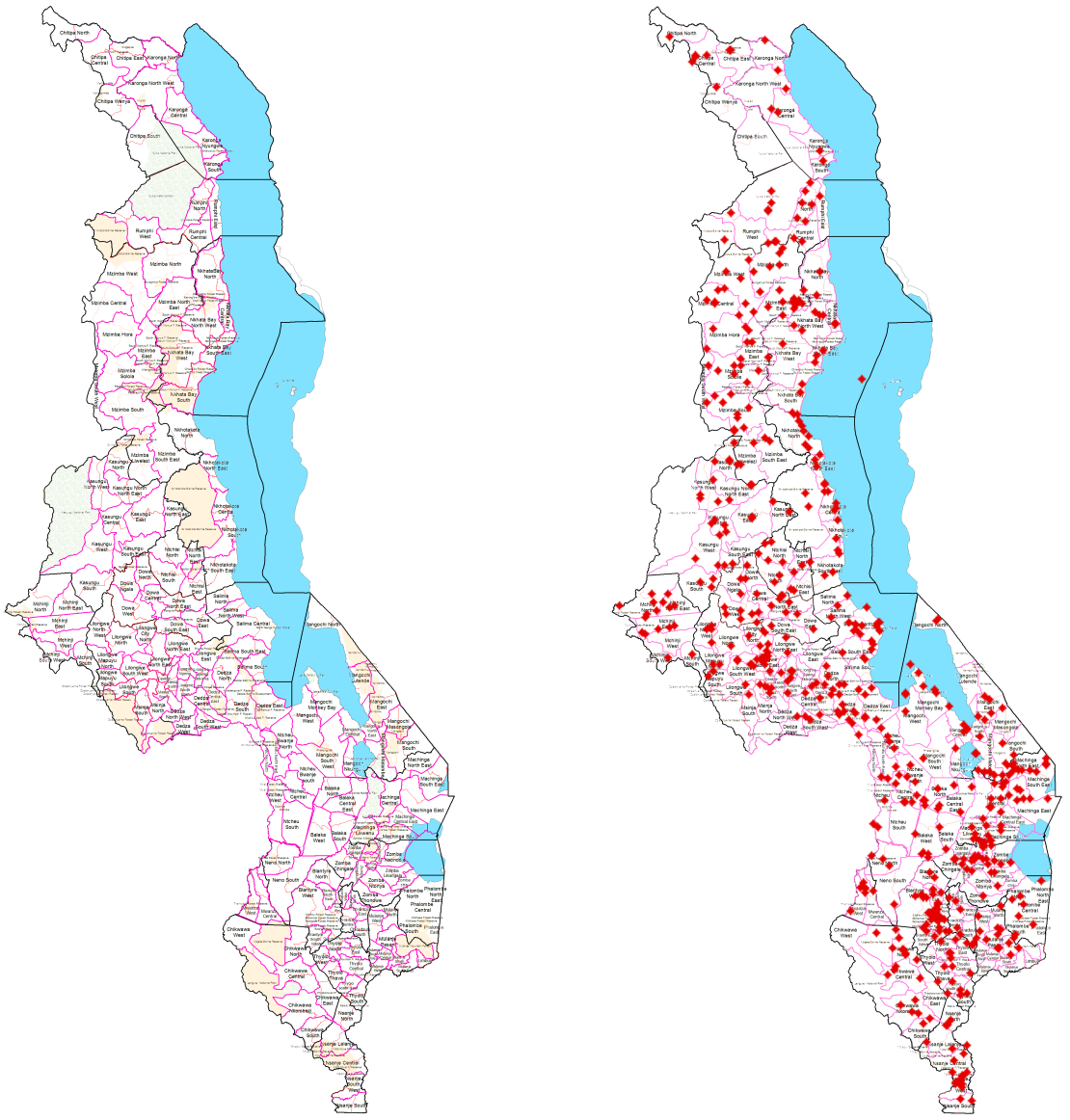


Figure 4: Nighttime images for Malawi in 1999 (left) and 2010 (right)

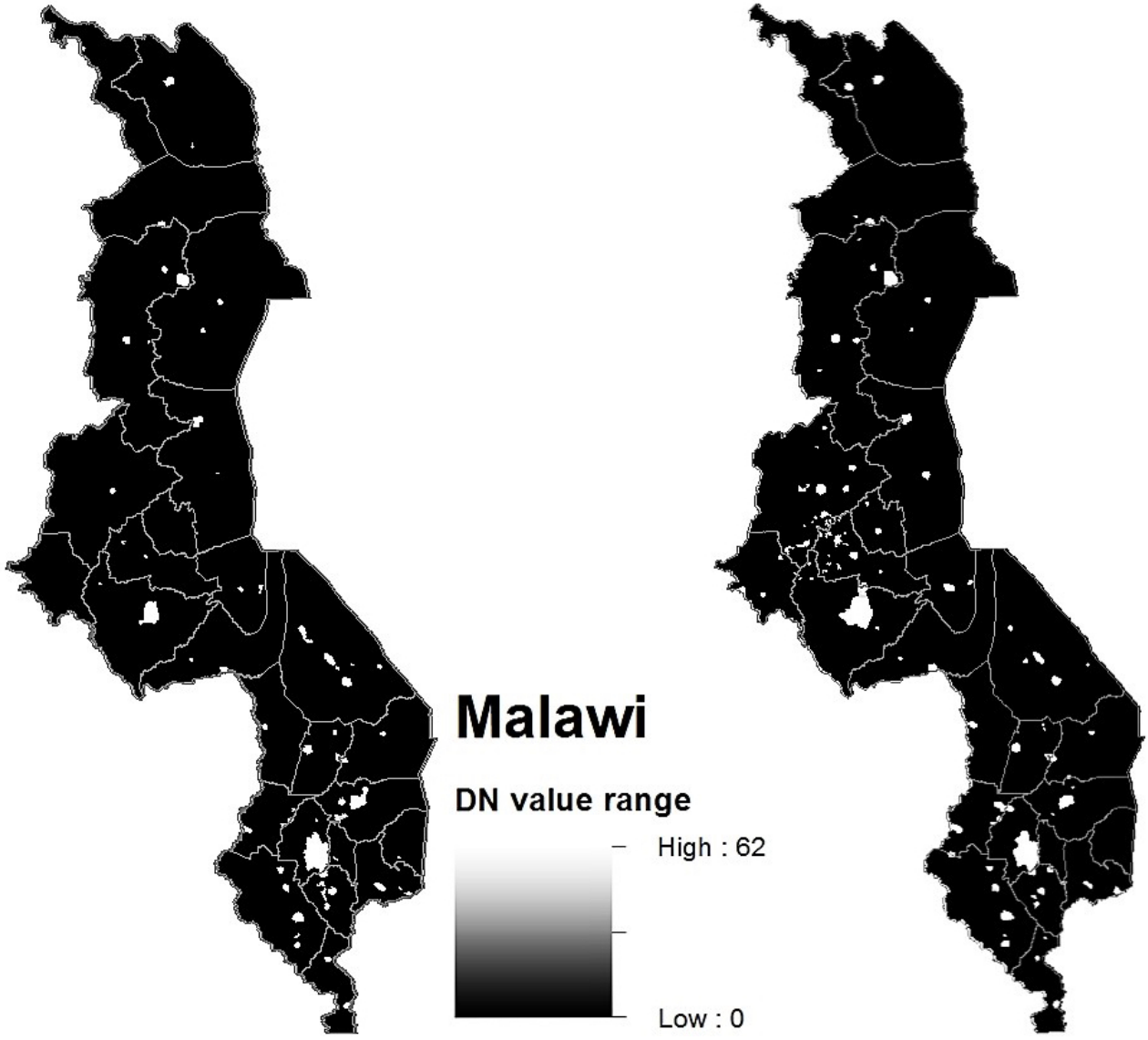
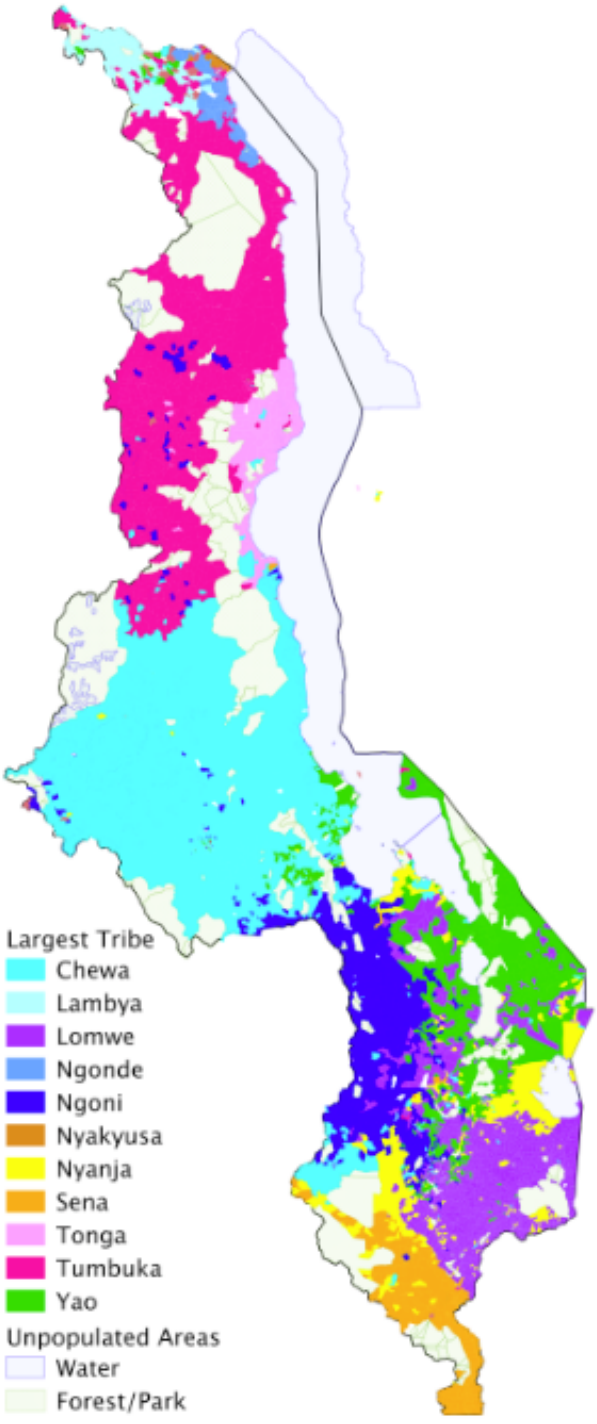


Figure 5: Spatial distribution of ethnic groups in Malawi



Source: Figure from Robinson (2016)

Figure 6: Allocation of aid under two Presidencies

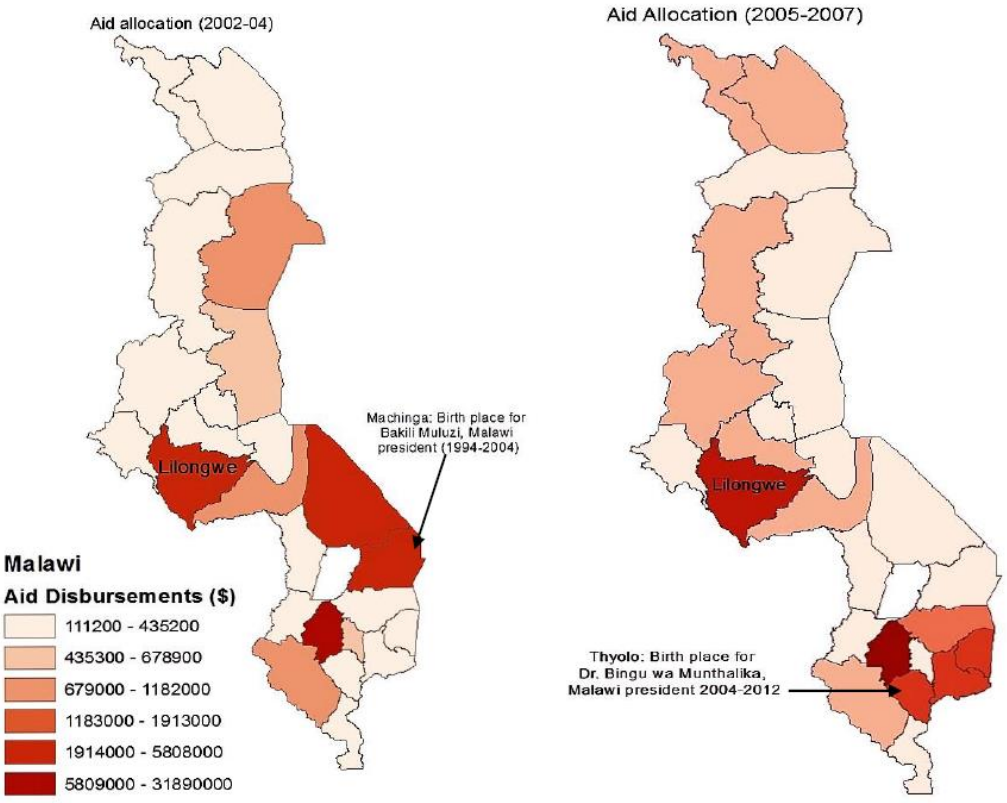


Figure 7: Map of political change in Malawi between 2004 and 2005

(a) Malawi political landscape 2004 (b) Malawi political landscape 2005

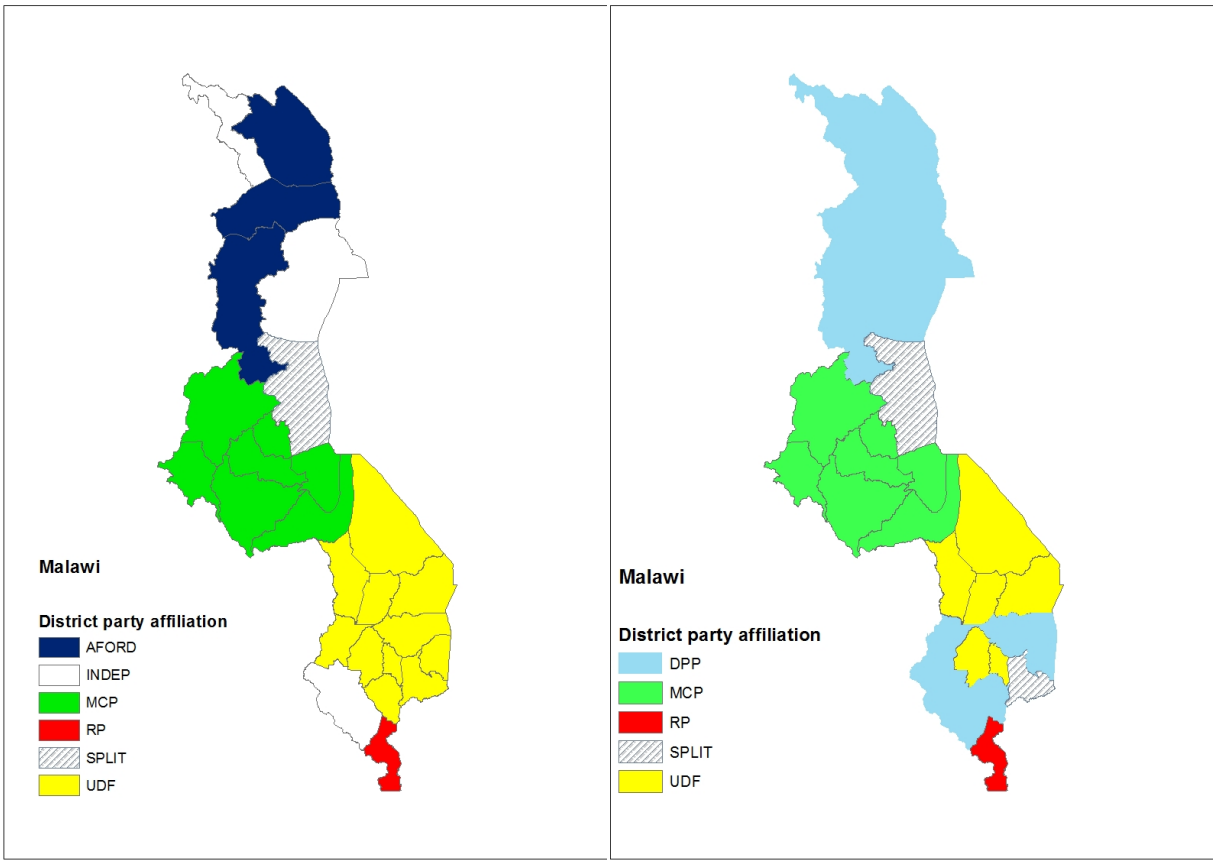


Figure 8: Lagged growth effect at constituency level

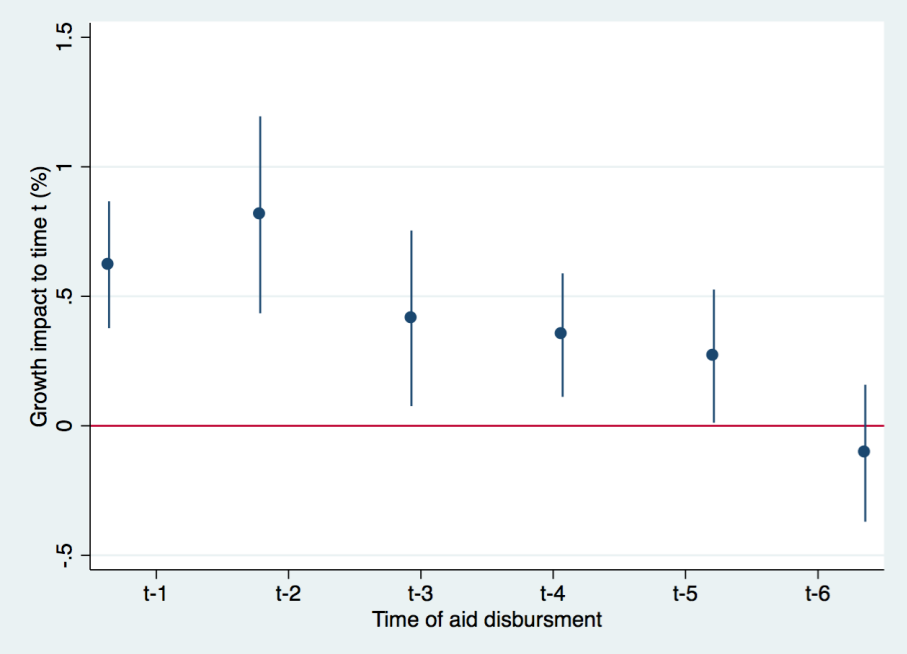
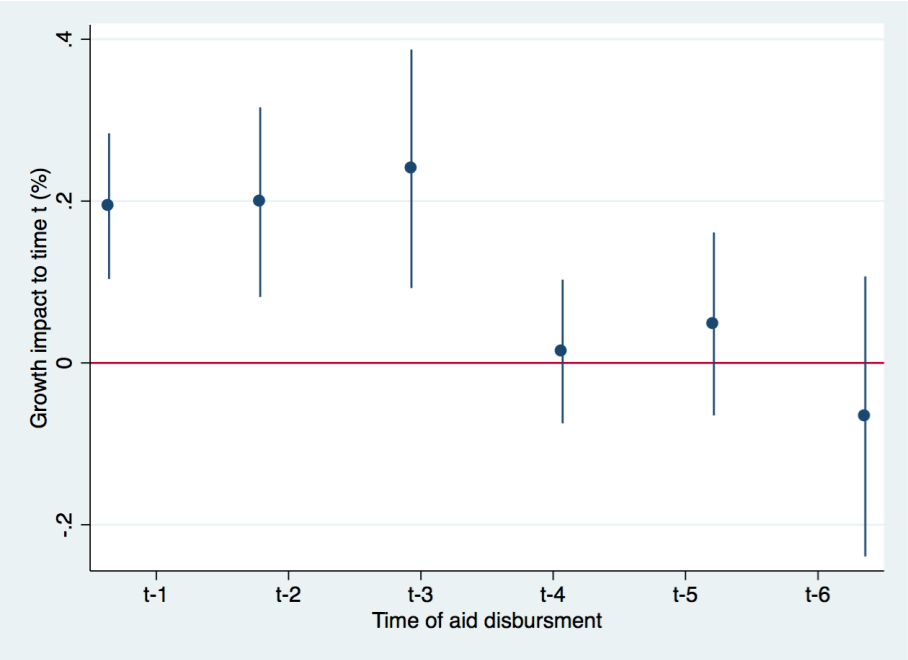


Figure 9: Lagged growth effect at district level



B Tables

Table 1: Data descriptions and sources

Variable	Description	Source	Years
Light density	Average nighttime light intensity per constituency or district	National Geographical Data Centre (`http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html`)	1999 - 2013
Household Consumption	District level averages of annual real consumption.	World Bank Living Standards Measurement Study, IHS3.	2010–11, 2013.
Distributed aid	Amount of aid distributed to each constituency or district, measured in million US dollars.	Malawi Ministry of Finance's Aid Management Platform (AMP) and AidData (`http://www.aiddata.org`)	2000 - 2013
Political Affinity	For constituency results, this is a dummy equal to 1 if the MP has defected from their political party to join the ruling party. For district results, it is the proportion of Members of Parliament in a district who defected.	Malawi Electoral Commission (MEC) Reports and Hansards from the Malawi Parliament Library	1999, 2004, 2009
Ethnic Affinity	The proportion of a District's population that belong to the same ethnicity as the ruling President. For constituencies, it is the proportion of the constituencies' population co-ethnic with the President, estimated based on the district averages.	National Statistical Office (NSO) population census reports (`http://www.nsomalawi.mw`)	1999 and 2008
Population density	Estimate of a district's population density (number of people per square kilometre).	National Statistical Office (NSO) population census reports (`http://www.nsomalawi.mw`)	2000 and 2008
Public expenditures	Estimate of all available financing at district level including central government transfers, but excludes foreign aid.	National Local Government Finance Commission (NLGFC) annual reports	2004 - 2013
Poverty rate	Percentage of population per district whose incomes are below the international poverty line ($1.25/day)	NSO's Integrated Household Surveys (IHS); Demographic and Health Surveys and Living standards Management Surveys	2000, 2004, 2010
Rainfall	Estimated amounts of rainfall received in each constituency or district.	Meteorological reports from Weather stations across Malawi	1999 - 2013
Minister	Dummy variable that which takes the value 1 if a constituency or district is home to a current Cabinet member, or 0 otherwise	Various reports from the Office of the President and Cabinet (OPC); Parliamentary Hansards	1999 - 2013
constituencies	Total number of constituencies in district	Parliamentary Hansards	1999 - 2013
Distance from Lilongwe	This is an estimated distance from each particular district to the capital city (Lilongwe)	Google maps (`https://www.google.co.uk/maps`	
Total land area	Estimated total land area in each district	Google maps (`https://www.google.co.uk/maps`)	
Gross primary enrolment	Number of students enrolled in primary school in a district	Ministry of Education, Science and Technology reports from the Education Management Information System (EMIS)	1999 - 2013
Number of classroom buildings	Total number of building used as classrooms in a district	Ministry of Education, Science and Technology reports from the Education Management Information System (EMIS)	2000 - 2013
Life expectancy	Estimated average life expectancy of the population in a district	NSO's Integrated Household Surveys (IHS); Demographic and Health Surveys and Living standards Management Surveys	2000, 2004, 2010
Infant mortality	Estimated number of deaths of infants (under 1 year) per 1000 live births in a district	NSO's Integrated Household Surveys (IHS); Demographic and Health Surveys and Living standards Management Surveys	2000, 2004, 2011
Food insecurity rate	Proportion of the population in a district who are reported to have inadequate food to sustain them throughout the year	NSO's Integrated Household Surveys (IHS); Demographic and Health Surveys and Living standards Management Surveys	2000, 2004, 2012

Table 2: List of Malawi districts used in the study

Region	Districts (Full sample)	Districts (Preferred sample)
Northern	Chitipa	Chitipa
	Karonga	Karonga
	Likoma	
	Mzimba	Mzimba
	Nkhatabay	Nkhatabay
	Rumphi	Rumphi
Central	Dedza	Dedza
	Dowa	Dowa
	Kasungu	Kasungu
	Lilongwe	
	Mchinji	Mchinji
	Nkhotakota	Nkhotakota
	Ntcheu	Ntcheu
	Ntchisi	Ntchisi
	Salima	Salima
Southern	Balaka	Balaka
	Blantyre	
	Chikwawa	Chikwawa
	Chiladzulu	Chiladzulu
	Machinga	Machinga
	Mangochi	Mangochi
	Mulanje	Mulanje
	Mwanza	Mwanza
	Neno	
	Nsanje	Nsanje
	Phalombe	Phalombe
	Thyolo	Thyolo
	Zomba	Zomba

Notes: The table lists Malawi's administrative districts. In the full sample column, are all the 28 districts while in the preferred sample column has the 24 districts that are used in the main specifications reported. We drop the main cities, Blantyre and Lilongwe, as well as districts that were formed from borders changes, Likoma and Neno.

Table 3: District Light Density and Household Consumption

Correlations in levels

		Light Density	PC Cons.	HH Cons.
2010	Light Density	1		
	Per Capita Consumption	0.6048	1	
	Household Consumption	0.555	0.9796	1
2011	Light Density	1		
	Per Capita Consumption	0.5201	1	
	Household Consumption	0.547	0.9586	1
2013	Light Density	1		
	Per Capita Consumption	0.7254	1	
	Household Consumption	0.6809	0.9858	1

Correlations of growth rates

		Δ LD	Δ PC Cons.	Δ HH Cons.
2010-11	Δ Light Density	1		
	Δ Per Capita Consumption	0.7119	1	
	Δ Household Consumption	0.6434	0.9815	1
2011-13	Δ Light Density	1		
	Δ Per Capita Consumption	0.5865	1	
	Δ Household Consumption	0.5347	0.9736	1
2010-13	Δ Light Density	1		
	Δ Per Capita Consumption	0.5228	1	
	Δ Household Consumption	0.4793	0.9648	1

Notes: All data is from the World Bank LSMS Panel Surveys. Growth is the difference in log level; level variables are in logs. Per capita (PC) consumption is the district average total real annual consumption per person; household (HH) consumption is district average total real annual consumption per household.

Table 4: District level descriptive statistics

				Percentiles		
	Obs	Mean	Std dev	25th	50th	75th
Light growth	332	0.0557	0.4711	-0.2291	0.0232	0.3015
Aid (log)	252	15.6832	1.1076	15.0614	15.7485	16.4323
Public expenditures (log)	336	14.0118	0.9927	13.1956	14.087	14.8704
Population density (log)	336	4.769	0.6449	4.3224	4.8178	5.1567
Rainfall (log)	336	6.8324	0.2999	6.638	6.8243	7.0475
Poverty rate	336	57.9478	13.0458	47.85	59.6	67.2
District vote share	336	0.5475	0.282	0.2734	0.5441	0.8187
Minister dummy	336	0.5361	0.4994	0	1	1
Gross primary enrollment	335	11.5109	0.6026	11.1838	11.4755	11.8864
Number of classroom buildings	335	6.8623	0.3951	6.608	6.8211	7.0825
Life expectancy	336	3.8552	0.0882	3.7865	3.8373	3.9057
Infant mortality	336	4.4389	0.3269	4.2529	4.4015	4.5508
Food insecurity rate	336	48.4574	17.3179	36.05	46.8	61.7
Maize production	336	11.1376	0.6804	10.7866	11.1856	11.5834
Ethnic affinity	336	0.2687	0.3088	0.01	0.09	0.61
Political switching	336	0.3403	0.4418	0	0	0.86

Notes: The table shows summary statistics of the main variables used in the analysis. Variables are mean averages over 24 districts in the preferred sample.

Table 5: Composition of Parliament and Defections (1999 - 2013)

	Ruling party	**AFORD**	**DPP**	**MCP**	**UDF**	**RP**	**NDA**	**PPM**	**PP**	**Other**	**Ind.**	**Def.**
1999 (E)	UDF	29	–	66	93	–	–	–	–	0	5	0
2001	UDF	29	–	64	97	–	–	–	–	0	3	4
2003	UDF	30	–	64	99	–	–	–	–	0	0	9
2004 (E)	UDF	6	–	57	49	15	9	6	–	5	40	0
2005	DPP	1	74	53	37	3	0	0	–	0	25	68
2007	DPP	1	102	53	32	3	0	0	–	0	0	98
2009 (E)	DPP	1	114	26	17	0	0	0	–	3	32	0
2010	DPP	1	147	24	17	0	0	0	–	3	1	34
2012	PP	1	69	24	11	0	0	0	88	0	0	89
2013	PP	1	65	24	18	0	0	0	85	0	0	85

Notes: The table presents the composition of Parliament showing the number of seats held by each political party in the Chamber. (E) denotes a general election in that year. AFORD stands for Alliance for Democracy; DPP for Democratic Progressive Party; MCP for Malawi Congress Party; UDF for United Democratic Front; RP for Republican Party; NDA for National Democratic Party; PPM for Peoples Progressive Movement; PP for Peoples Party; Ind. is number of independent MPs; and Def. is the total number of MPs who have crossed the floor since the last elections. Entries marked '–' are years prior to the formation of the party.

Table 6: Constituency results with both instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
Aid (log)	0.1123***	0.6213***	0.6206***	0.6234***	0.6298***	0.6219***
	(0.0377)	(0.1109)	(0.1134)	(0.1190)	(0.1238)	(0.1250)
Light density (log)	-0.4319***	-0.8691***	-0.8692***	-0.8623***	-0.8664***	-0.8629***
	(0.0427)	(0.1080)	(0.1079)	(0.1111)	(0.1144)	(0.1153)
Population (log)	0.1861		0.1274	0.3411	0.3056	0.3875
	(1.0329)		(1.5356)	(1.4714)	(1.4916)	(1.4424)
Poverty rate (%)	0.0005			0.0038	0.0040	0.0039
	(0.0025)			(0.0033)	(0.0034)	(0.0034)
Rainfall (log)	-0.0843				0.0496	0.0459
	(0.1275)				(0.1213)	(0.1224)
Minister (dummy)	0.0618*					0.0729**
	(0.0304)					(0.0345)
First stage						
Ethnic affinity		0.5078***	0.5149***	0.4889***	0.4887***	0.4916***
		(0.1283)	(0.1334)	(0.1234)	(0.1225)	(0.1243)
Political switching		0.3274***	0.3274***	0.3357***	0.3276***	0.3303***
		(0.0621)	(0.0624)	(0.0626)	(0.0617)	(0.0613)
Observations	1,196	1,196	1,196	1,196	1,196	1,196
Constituency and Year FE	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0002	0.0002	0.0002	0.0002	0.0003
KP Wald F-statistic		27.12	24.48	25.72	25.97	25.69
Hansen J (p-value)		0.848	0.848	0.687	0.716	0.707

Notes: The table presents results from regression of the change in the log of light intensity in each constituency for the period 1999-2013. Two instrumental variables are used, political switching, which is a dummy equal to one if the member of Parliament switches to the party of the President, and ethnic affinity, measured as the share of population in the constituency that is co-ethnic with the sitting President. All regressions omit constituencies from the two cities of Blantyre and Lilongwe (two districts, namely Neno and Likoma, are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-7 use the preferred sample and stepwise inclusion of control variables. Robust standard errors, clustered at district level, are reported in parentheses: $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$..

Table 7: District results with both instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Aid (log)	0.0842**	0.2063***	0.2047***	0.1946***	0.1937***	0.1960***	0.1937***
	(0.0353)	(0.0487)	(0.0489)	(0.0447)	(0.0428)	(0.0465)	(0.0459)
Light density (log)	-0.9276***	-0.9369***	-0.9377***	-0.9464***	-0.9576***	-0.9548***	-0.9551***
	(0.0736)	(0.0714)	(0.0714)	(0.0695)	(0.0706)	(0.0718)	(0.0725)
Public expenditure (log)	0.0326	0.0418	0.0400	0.0459	0.0399	0.0397	0.0452
	(0.0336)	(0.0341)	(0.0345)	(0.0360)	(0.0368)	(0.0368)	(0.0372)
Population (log)	1.0825	1.2508***	1.2670***	1.3527***	0.3802	0.2953	0.4599
	(1.3714)	(0.4484)	(0.4547)	(0.4211)	(1.1815)	(1.2266)	(1.2577)
Rainfall (log)	-0.0850	-0.0513	-0.0509	-0.0467	-0.0439	-0.0425	-0.0400
	(0.0993)	(0.1119)	(0.1120)	(0.1081)	(0.1080)	(0.1087)	(0.1075)
Poverty rate (%)	0.0013	0.0030	0.0031	0.0030	0.0025	0.0026	0.0025
	(0.0041)	(0.0044)	(0.0044)	(0.0043)	(0.0044)	(0.0044)	(0.0044)
Primary enrolment (log)	0.2901		0.0201	0.2224*	0.3109**	0.3085**	0.2959**
	(0.1869)		(0.0154)	(0.1343)	(0.1425)	(0.1411)	(0.1442)
Classroom buildings (log)	-0.4168			-0.5180	-0.5200	-0.5465	-0.5536
	(0.4306)			(0.3686)	(0.3527)	(0.3639)	(0.3624)
Life expectancy (log)	0.0692				0.0613	0.0486	0.0395
	(0.0831)				(0.0686)	(0.0747)	(0.0774)
Infant mortality (log)	0.3876					-0.3691	-0.4173
	(0.9282)					(0.8683)	(0.9028)
Food insecurity (%)	-0.0858						-0.0742
	(0.0844)						(0.0794)
First stage							
Ethnic affinity		1.7353***	1.7192***	1.7757***	1.7756***	1.7193***	1.7191***
		(0.1721)	(0.1733)	(0.1957)	(0.1975)	(0.1920)	(0.1918)
Political switching		0.2463*	0.2455*	0.2603**	0.2603**	0.2208*	0.2283*
		(0.1308)	(0.1307)	(0.1295)	(0.1297)	(0.1223)	(0.1172)
Observations	248	248	248	248	248	248	248
District and Year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0058	0.0064	0.0068	0.0059	0.0056	0.0061
KP Wald F-statistic		96.13	92.41	59.25	58.13	51.57	53.38
Hansen J (p-value)		0.117	0.115	0.124	0.120	0.114	0.131

Notes: The table presents results from regression of the annual change in the log of recorded nighttime light density in each district for the period 1999 to 2013. Two instrumental variables are used, in particular political switching, which is the share of members of parliament that switch to the party of the President, and ethnic affinity, measured as the share of population in the district that is co-ethnic with the sitting President. Columns 1-10 do not include the two cities of Blantyre and Lilongwe (other districts, namely Neno and Likoma are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-10 use the preferred sample and stepwise inclusion of control variables. Robust standard errors are reported in parentheses. $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$.

Table 8: Lags of aid (constituency level)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables lagged to:	$t-1$	$t-2$	$t-3$	$t-4$	$t-5$	$t-6$
Aid (log)	0.6219***	0.8147***	0.4150**	0.3502***	0.2691**	-0.1059
	(0.1250)	(0.1940)	(0.1730)	(0.1216)	(0.1312)	(0.1349)
Light density (log)	-0.8629***	-1.3279***	-1.1717***	-1.3866***	-1.3574***	-1.0454***
	(0.1153)	(0.1619)	(0.1888)	(0.1164)	(0.1080)	(0.1126)
Population (log)	0.3875	-1.1316	-1.4597	1.0346	0.9675	0.5904
	(1.4424)	(1.8131)	(1.7025)	(1.9685)	(1.9526)	(1.4677)
Poverty rate (%)	0.0039	-0.0021	-0.0078	-0.0106	-0.0084	-0.0101*
	(0.0034)	(0.0045)	(0.0069)	(0.0080)	(0.0065)	(0.0056)
Rainfall (log)	0.0459	0.0575	-0.1584	0.0158	-0.1464	-0.0394
	(0.1224)	(0.1157)	(0.1404)	(0.1148)	(0.0980)	(0.1011)
Minister (dummy)	0.0729**	0.1156**	0.0807*	0.0784	0.0389	0.0428
	(0.0345)	(0.0499)	(0.0459)	(0.0498)	(0.0501)	(0.0333)
First stage						
Ethnic affinity	0.4916***	0.4371***	0.4100**	0.3478*	0.2889	0.4425**
	(0.1243)	(0.1405)	(0.1661)	(0.1928)	(0.2361)	(0.2083)
Political switching	0.3303***	0.3216***	0.3604***	0.3664***	0.3066***	0.3288***
	(0.0613)	(0.0587)	(0.0748)	(0.0850)	(0.0913)	(0.1063)
Observations	1,196	1,087	970	853	723	573
Constituency and Year FE	Y	Y	Y	Y	Y	Y
AR F-test (p-value)	0.0003	0.0024	0.1660	0.0472	0.0878	0.4910
KP Wald F-statistic	25.69	27.02	20.40	12.52	7.031	12.15
Hansen J (p-value)	0.707	0.725	0.732	0.728	0.861	0.254

Notes: The table presents results from regression of the change from time $(t-n)$ to t in the log of recorded nighttime light density in each constituency for the period 1999 to 2013. All regressions use the preferred specification. Two instrumental variables are used, in particular political switching, which is a dummy equal to one if the member of Parliament switches to the party of the President, and ethnic affinity, measured as the share of population in the constituency that is co-ethnic with the sitting President. In all the regressions, district fixed effects are included and omit the two cities of Blantyre and Lilongwe (neither are the two districts of Neno and Likoma). Columns 1-6 reports results on the effect of aid with variables lagged as specified in column headers. Robust standard errors clustered at district in all specifications are reported in parentheses. $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$.

Table 9: Lags of aid (district level)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables lagged to:	$t-1$	$t-2$	$t-3$	$t-4$	$t-5$	$t-6$
Aid (log)	0.1937***	0.1987***	0.2399***	0.0141	0.0482	-0.0661
	(0.0459)	(0.0598)	(0.0752)	(0.0453)	(0.0577)	(0.0883)
Light density (log)	-0.9551***	-0.7315***	-1.1522***	-0.8011***	-1.2367***	-0.9056***
	(0.0725)	(0.0502)	(0.0917)	(0.1842)	(0.1041)	(0.1858)
Public expenditure (log)	0.0452	0.1662***	0.5256***	0.2285***	0.0110	-0.4350***
	(0.0372)	(0.0507)	(0.0858)	(0.0570)	(0.0492)	(0.0749)
Population (log)	0.4599	0.7881	0.5661	1.8571	-1.1779	6.1958**
	(1.2577)	(1.2519)	(2.1328)	(1.3781)	(2.2794)	(3.0706)
Rainfall (log)	-0.0400	0.1547	-0.3352**	0.2535*	0.1010	0.2067
	(0.1075)	(0.0997)	(0.1310)	(0.1524)	(0.1526)	(0.1323)
Poverty rate (%)	0.0025	0.0042	0.0006	-0.0061	0.0001	0.0089
	(0.0044)	(0.0045)	(0.0047)	(0.0040)	(0.0030)	(0.0060)
Primary enrolment (log)	0.2959**	0.3800	0.2854	-0.3725	-0.6301*	0.1136
	(0.1442)	(0.3958)	(0.3514)	(0.2428)	(0.3348)	(0.6509)
Classroom buildings (log)	-0.5536	-1.0242***	-0.5602	0.4946	0.3813	0.1650
	(0.3624)	(0.3463)	(0.4524)	(0.3575)	(0.4178)	(1.0825)
Life expectancy (log)	0.0395	-0.1447	-0.2217*	-0.1617	0.2118**	-0.0854
	(0.0774)	(0.0934)	(0.1207)	(0.1384)	(0.0970)	(0.1532)
Infant mortality (log)	-0.4173	-1.9670	-0.5080	-0.9616	0.5593	-5.1005***
	(0.9028)	(1.2595)	(1.8090)	(1.4473)	(1.8563)	(1.6561)
Food insecurity (%)	-0.0742	0.0034	0.1291	0.2350**	0.7682***	-0.1305
	(0.0794)	(0.1056)	(0.1573)	(0.1024)	(0.1389)	(0.2057)
First stage						
Ethnic affinity	1.7191***	1.3387***	1.3009***	1.3102***	1.1244***	0.9111*
	(0.1918)	(0.2400)	(0.2679)	(0.2890)	(0.3486)	(0.4952)
Political switching	0.2283*	0.6330**	0.6658***	0.6654**	0.8467***	0.6763
	(0.1172)	(0.2458)	(0.2538)	(0.2735)	(0.3269)	(0.5001)
Observations	248	224	201	176	152	129
District and Year FE	Y	Y	Y	Y	Y	Y
AR F-test (p-value)	0.0062	0.0039	0.0108	0.9570	0.6390	0.6380
KP Wald F-statistic	53.38	35.50	28.18	23.97	18.77	8.824
Hansen J (p-value)	0.131	0.313	0.884	0.994	0.506	0.404

Notes: The table presents results from regression of the change from time $(t-n)$ to t in the log of recorded nighttime light density in each district for the period 1999 to 2013. All regressions use the preferred specification. Two instrumental variables are used, in particular political switching, which is the share of members of parliament that switch to the party of the President, and ethnic affinity, measured as the share of population in the district that is co-ethnic with the sitting President. In all the regressions, district fixed effects are included and do not include the two cities of Blantyre and Lilongwe (neither are the two districts of Neno and Likoma). Columns 1-6 reports results on the effect of aid with variables lagged as specified in column headers. Robust standard errors are reported in parentheses. $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$.

Table 10: Regression results by aid sector

	(1)	(2)	(3)
Sector:	Agriculture	Education	Health
Aid to sector (log)	0.5753***	0.3163*	0.1124*
	(0.2123)	(0.1678)	(0.0577)
Light density (log)	-0.9334***	-1.3128***	-1.2514***
	(0.2005)	(0.0990)	(0.0619)
Public expenditure (log)	-0.3162**	-0.0124	-0.0244
	(0.1596)	(0.0648)	(0.0462)
Population (log)	-1.9030	4.5466**	3.0316**
	(2.7218)	(2.2054)	(1.4206)
Rainfall (log)	-0.0137	-0.1015	-0.1790
	(0.1748)	(0.1639)	(0.1558)
Poverty rate (%)	0.3122	0.0837	-0.5108**
	(0.4738)	(0.3135)	(0.2248)
Primary enrolment (log)	1.2310	-0.0629	-0.0986
	(1.0507)	(0.3227)	(0.2663)
Classroom buildings (log)	-0.4879	-0.1108	0.2781
	(0.6028)	(0.4553)	(0.4620)
Life expectancy (log)	10.1032	-8.2450	-1.3182
	(8.8310)	(9.7916)	(6.2888)
Infant mortality (log)	-1.8729	-1.9006	-0.8266
	(1.7603)	(2.1333)	(1.6123)
Food insecurity (%)	-0.3172	0.0781	-0.0951
	(0.2490)	(0.1260)	(0.1754)
First stage			
Ethnic affinity	0.5568	0.7236	0.9628
	(0.4852)	(0.4973)	(0.6739)
Political switching	0.1986	0.1171	0.9411**
	(0.2312)	(0.3323)	(0.3761)
Observations	265	195	188
District and Year FE	Y	Y	Y
AR F-test (p-value)	0.0001	0.0608	0.2950
KP Wald F-statistic	3.959	5.953	7.229
Hansen J (p-value)	0.629	0.643	0.706

Notes: The table presents results from regression of the annual change in the log of recorded nighttime light density in each district for the period 1999 to 2013. All regressions use the preferred specification. Two instrumental variables are used, in particular political switching, which is the share of members of parliament that switch to the party of the President, and ethnic affinity, measured as the share of population in the district that is co-ethnic with the sitting President. In all the regressions, district fixed effects are included and omit the two cities of Blantyre and Lilongwe. The first column presents results from estimation using aid to the agriculture sector, the second column has results for aid to the education sector and the final column has results for estimation with using health sector aid. $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$.

Table 11: Regression results for estimation using types of aid

	(1)	(2)	(3)	(4)
Aid type:	Grants	Loans	Multilateral	Bilateral
Aid of type (log)	0.2672**	0.1594	0.1735**	0.2370**
	(0.1192)	(0.1045)	(0.0836)	(0.1018)
Light density (log)	-1.1947***	-1.2251***	-1.1787***	-1.1536***
	(0.0883)	(0.0789)	(0.0838)	(0.0806)
Public expenditure (log)	0.0011	-0.0003	-0.0117	0.0604
	(0.0463)	(0.0415)	(0.0446)	(0.0500)
Population (log)	1.2449	3.2977***	1.4059	2.1586*
	(1.3566)	(1.1706)	(1.3420)	(1.2194)
Rainfall (log)	-0.1312	-0.1730*	-0.1531	-0.0494
	(0.1057)	(0.0998)	(0.1451)	(0.1305)
Poverty rate (%)	-0.2800	-0.3333	-0.2047	-0.2851
	(0.2526)	(0.2575)	(0.3080)	(0.2031)
Primary enrolment (log)	-0.1978	-0.0441	0.1659	-0.2936
	(0.2405)	(0.1995)	(0.1873)	(0.2506)
Classroom buildings (log)	0.7786*	0.2948	0.0210	0.7324*
	(0.4180)	(0.4438)	(0.4495)	(0.4342)
Life expectancy (log)	1.3537	0.5778	4.3949	-1.7165
	(5.4888)	(5.5239)	(3.9362)	(5.7046)
Infant mortality (log)	-1.3538	-0.5306	-0.4629	-0.4264
	(1.7889)	(1.7243)	(1.5741)	(1.2804)
Food insecurity (%)	-0.0916	-0.0301	-0.1417	-0.2706*
	(0.1124)	(0.1086)	(0.1414)	(0.1422)
First stage				
Ethnic affinity	0.8540**	0.9571***	0.5852*	1.0565**
	(0.3592)	(0.2791)	(0.3115)	(0.4542)
Political switching	0.2061	0.3419**	0.7124***	-0.0687
	(0.2726)	(0.1461)	(0.1871)	(0.2717)
Observations	226	212	220	211
District and Year FE	Y	Y	Y	Y
AR F-test (p-value)	0.0668	0.3350	0.1490	0.0514
KP Wald F-statistic	5.362	13.46	21.94	2.727
Hansen J (p-value)	0.584	0.726	0.479	0.132

Notes: The table presents results from regression of the annual change in the log of recorded nighttime light density in each district for the period 1999 to 2013. All regressions use the preferred specification. Two instrumental variables are used, in particular political switching, which is the share of members of parliament that switch to the party of the President, and ethnic affinity, measured as the share of population in the district that is co-ethnic with the sitting President. In all the regressions, district fixed effects are included and omit the two cities of Blantyre and Lilongwe (neither are the two districts of Neno and Likoma). The first column presents results from estimation using bilateral aid, second column has results for multilateral aid, the third column presents results for regressions using aid disbursed in the form of grants and the final column has results for estimation for aid in the form of loans. $^{***}p¡0.01$, $^{**}p¡0.05$, $^{*}p¡0.1$.

C Additional Tables (for online appendix)

Table 12: Results for OLS regression of district vote share

	1	2	3	4	5	6	7
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Winner's birth district	0.1230	-0.0014	-0.0061	0.0306	0.0288	-0.0234	-0.0153
	(0.1579)	(0.1860)	(0.1803)	(0.1004)	(0.1078)	(0.1061)	(0.1116)
Population	-0.9644	-1.3619	-1.2799	-0.9059	-0.5950	-1.0814	-0.7134
	(2.1541)	(1.9110)	(2.2686)	(0.8304)	(0.8840)	(0.7984)	(0.8382)
Poverty rate	-0.0003	0.0392	0.0156	0.0038	0.0126	0.0212	0.0210
	(0.1292)	(0.1197)	(0.1427)	(0.0574)	(0.0595)	(0.0602)	(0.0603)
Northern region	0.0921	0.1035*	0.1008	0.0436**	0.0357	0.0490**	0.0395*
	(0.0636)	(0.0558)	(0.0659)	(0.0208)	(0.0247)	(0.0190)	(0.0227)
Central region	0.0403	0.0526	0.0509	0.0255	0.0184	0.0311	0.0226
	(0.0692)	(0.0610)	(0.0675)	(0.0246)	(0.0249)	(0.0233)	(0.0234)
Southern region	0.0402	0.0526	0.0508	0.0254	0.0183	0.0310	0.0226
	(0.0691)	(0.0610)	(0.0674)	(0.0246)	(0.0249)	(0.0233)	(0.0234)
Urban districts	-0.0032	0.0003	0.0003	0.0134*	0.0133**	0.0148**	0.0142**
	(0.0143)	(0.0137)	(0.0125)	(0.0068)	(0.0063)	(0.0070)	(0.0065)
Chewa			0.0003		-0.0074		-0.0076
			(0.0173)		(0.0101)		(0.0100)
Yao			-0.0001*		0.0000		0.0000
			(0.0001)		(0.0000)		(0.0000)
Lomwe			-0.0091		0.0047		0.0021
			(0.0184)		(0.0068)		(0.0076)
Winner's ethnic population (%)		0.2180	0.2346			0.0959	0.0818
		(0.1887)	(0.1958)			(0.0731)	(0.0824)
Political identification				0.4771***	0.4824***	0.4729***	0.4781***
				(0.0418)	(0.0439)	(0.0404)	(0.0428)
Observations	360	360	360	360	360	360	360
R-squared	0.2606	0.2800	0.2845	0.8075	0.8124	0.8112	0.8150
District and Year FE	Y	Y	Y	Y	Y	Y	Y
Number of id	24	24	24	24	24	24	24

*Notes: The table presents results of fixed effects panel regression on the share of votes that a winning candidate received during a general election (held in 1999, 2004 and 2009) from each district on ethnicity, measured as the proportion of population that is co-ethnic with the winning candidate; and party identification, a dummy variable that takes the value 1 if the winner's party is dominant in the district, and 0 otherwise. Robust standard errors in parentheses: *p<0.10;**p<0.05;***p<0.01.*

Table 13: Constituency results with ethnic affinity instrument

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Aid (log)	0.1123***	0.6448***	0.6431***	0.6712***	0.6738***	0.6669***	0.6669***
	(0.0377)	(0.1379)	(0.1355)	(0.1400)	(0.1414)	(0.1426)	(0.1426)
Light density (log)	-0.4319***	-0.8895***	-0.8888***	-0.9031***	-0.9035***	-0.9009***	-0.9009***
	(0.0427)	(0.1342)	(0.1324)	(0.1351)	(0.1353)	(0.1357)	(0.1357)
Population (log)	0.1861		0.1325	0.3685	0.3218	0.4053	0.4053
	(1.0329)		(1.5730)	(1.5491)	(1.5582)	(1.5081)	(1.5081)
Poverty rate (%)	0.0005			0.0041	0.0042	0.0042	0.0042
	(0.0025)			(0.0034)	(0.0034)	(0.0034)	(0.0034)
Rainfall (log)	-0.0843				0.0608	0.0574	0.0574
	(0.1275)				(0.1229)	(0.1238)	(0.1238)
Minister (dummy)	0.0618*					0.0739**	0.0739**
	(0.0304)					(0.0354)	(0.0354)
First stage							
Ethnic affinity		0.6217***	0.6288***	0.6145***	0.6085***	0.6108***	0.6108***
		(0.1564)	(0.1648)	(0.1530)	(0.1474)	(0.1493)	(0.1493)
Observations	1,196	1,196	1,196	1,196	1,196	1,196	1,196
Constituency and Year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0012	0.0011	0.0009	0.0008	0.0008	0.0008
KP Wald F-statistic		15.81	14.55	16.12	17.04	16.73	16.73

Notes: The table presents results from regression of the change in the log of light intensity in each constituency for the period 1999-2013. The instrumental variable used is the share of the constituency that is co-ethnic with the sitting President. All regressions omit constituencies from the two cities of Blantyre and Lilongwe (two districts, namely Neno and Likoma, are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-7 use the preferred sample and stepwise inclusion of control variables. Robust standard errors, clustered at district level, are reported in parentheses: $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$.

Table 14: Constituency results with political switching instrument

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Aid (log)	0.1123***	0.6051***	0.6049***	0.5943***	0.6015***	0.5931***	0.5931***
	(0.0377)	(0.1574)	(0.1587)	(0.1561)	(0.1654)	(0.1653)	(0.1653)
Light density (log)	-0.4319***	-0.8551***	-0.8556***	-0.8375***	-0.8425***	-0.8385***	-0.8385***
	(0.0427)	(0.1421)	(0.1405)	(0.1367)	(0.1435)	(0.1436)	(0.1436)
Population (log)	0.1861		0.1238	0.3245	0.2951	0.3761	0.3761
	(1.0329)		(1.5099)	(1.4258)	(1.4497)	(1.4013)	(1.4013)
Poverty rate (%)	0.0005			0.0036	0.0038	0.0037	0.0037
	(0.0025)			(0.0033)	(0.0034)	(0.0035)	(0.0035)
Rainfall (log)	-0.0843				0.0423	0.0385	0.0385
	(0.1275)				(0.1246)	(0.1255)	(0.1255)
Minister (dummy)	0.0618*					0.0723**	0.0723**
	(0.0304)					(0.0341)	(0.0341)
First stage							
Political switching		0.3744***	0.3747***	0.3832***	0.3751***	0.3775***	0.3775***
		(0.0711)	(0.0720)	(0.0718)	(0.0702)	(0.0702)	(0.0702)
Observations	1,196	1,196	1,196	1,196	1,196	1,196	1,196
Constituency and Year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0003	0.0003	0.0003	0.0004	0.0006	0.0006
KP Wald F-statistic		27.75	27.06	28.50	28.52	28.93	28.93

Notes: The table presents results from regression of the change in the log of light intensity in each consitutency for the period 1999-2013. Each observation is a District and Year statistic and most variables have been transformed to natural logs. The instrumental variable used (political) is a dummy variable that takes the value 1 if the constituency's Member of Parliament (MP) defects from the party with which he/she won the seat to join the ruling President's party. All regressions omit constituencies from the two cities of Blantyre and Lilongwe (two districts, namely Neno and Likoma, are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-7 use the preferred sample and stepwise inclusion of control variables. Robust standard errors, clustered at district level, are reported in parentheses: $^{***}p_i0.01$, $^{**}p_i0.05$, $^{*}p_i0.1$..

Table 15: District results with ethnic affinity instrument

	(1) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS	(8) 2SLS	(9) 2SLS
Aid (log)	0.0842**	0.1906***	0.1885***	0.1787***	0.1777***	0.1802***	0.1785***
	(0.0353)	(0.0456)	(0.0457)	(0.0419)	(0.0401)	(0.0432)	(0.0434)
Light density (log)	-0.9276***	-0.9318***	-0.9327***	-0.9412***	-0.9524***	-0.9508***	-0.9513***
	(0.0736)	(0.0716)	(0.0717)	(0.0700)	(0.0713)	(0.0721)	(0.0730)
Public expenditure (log)	0.0326	0.0401	0.0381	0.0439	0.0378	0.0378	0.0435
	(0.0336)	(0.0327)	(0.0330)	(0.0343)	(0.0352)	(0.0353)	(0.0356)
Population (log)	1.0825	1.3202***	1.3392***	1.4233***	0.4433	0.3817	0.5466
	(1.3714)	(0.4335)	(0.4382)	(0.4073)	(1.1932)	(1.2281)	(1.2663)
Rainfall (log)	-0.0850	-0.0577	-0.0572	-0.0532	-0.0504	-0.0491	-0.0463
	(0.0993)	(0.1100)	(0.1101)	(0.1068)	(0.1068)	(0.1075)	(0.1064)
Poverty rate (%)	0.0013	0.0028	0.0029	0.0028	0.0023	0.0024	0.0024
	(0.0041)	(0.0043)	(0.0042)	(0.0041)	(0.0043)	(0.0043)	(0.0043)
Primary enrolment (log)	0.2901		0.0228	0.2203	0.3095**	0.3079**	0.2951**
	(0.1869)		(0.0147)	(0.1359)	(0.1455)	(0.1441)	(0.1473)
Classroom buildings (log)	-0.4168			-0.5058	-0.5077	-0.5265	-0.5346
	(0.4306)			(0.3712)	(0.3554)	(0.3652)	(0.3632)
Life expectancy (log)	0.0692				0.0618	0.0531	0.0437
	(0.0831)				(0.0691)	(0.0734)	(0.0765)
Infant mortality (log)	0.3876					-0.2516	-0.3052
	(0.9282)					(0.8355)	(0.8770)
Food insecurity (%)	-0.0858						-0.0759
	(0.0844)						(0.0783)
First stage							
Ethnic affinity		1.8554***	1.8388***	1.9000***	1.8999***	1.8159***	1.8160***
		(0.1467)	(0.1491)	(0.1821)	(0.1841)	(0.1854)	(0.1853)
Observations	248	248	248	248	248	248	248
District and Year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0010	0.0012	0.0013	0.0011	0.0009	0.0013
KP Wald F-statistic		159.9	152.1	108.9	106.5	95.88	96.07

Notes: The table presents results from regression of the annual change in the log of recorded nighttime light density in each district for the period 1999 to 2013. Each observation is a District and Year statistic and, unless otherwise stated, most explanatory variables have been transformed into natural logs. The instrumental variable used (ethnic affinity) is measured as the proportion of a district's population that belong to the incumbent President's ethnicity. Columns 1-10 omit the two cities of Blantyre and Lilongwe (other districts, namely Neno and Likoma are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-10 use the preferred sample and stepwise inclusion of control variables. Robust standard errors in all specifications are reported in parentheses. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Table 16: District results with political switching instrument

	(1) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS	(8) 2SLS	(9) 2SLS
Aid (log)	0.0842**	0.3472***	0.3474**	0.3318**	0.3315***	0.3665**	0.3558**
	(0.0353)	(0.1344)	(0.1360)	(0.1292)	(0.1275)	(0.1586)	(0.1528)
Light density (log)	-0.9276***	-0.9824***	-0.9822***	-0.9916***	-1.0022***	-0.9978***	-0.9959***
	(0.0736)	(0.0886)	(0.0880)	(0.0855)	(0.0838)	(0.0852)	(0.0836)
Public expenditure (log)	0.0326	0.0568	0.0571	0.0638	0.0583	0.0607	0.0638
	(0.0336)	(0.0522)	(0.0542)	(0.0560)	(0.0566)	(0.0615)	(0.0613)
Population (log)	1.0825	0.6297	0.6271	0.7461	-0.1622	-0.6367	-0.4611
	(1.3714)	(0.7801)	(0.7993)	(0.7437)	(1.2196)	(1.4711)	(1.4236)
Rainfall (log)	-0.0850	0.0058	0.0057	0.0093	0.0121	0.0283	0.0265
	(0.0993)	(0.1382)	(0.1382)	(0.1318)	(0.1304)	(0.1356)	(0.1335)
Poverty rate (%)	0.0013	0.0047	0.0047	0.0045	0.0041	0.0045	0.0044
	(0.0041)	(0.0058)	(0.0058)	(0.0056)	(0.0058)	(0.0060)	(0.0059)
Primary enrolment (log)	0.2901		-0.0035	0.2403	0.3229**	0.3144**	0.3044*
	(0.1869)		(0.0288)	(0.1534)	(0.1599)	(0.1583)	(0.1582)
Classroom buildings (log)	-0.4168			-0.6231	-0.6254	-0.7618	-0.7561
	(0.4306)			(0.4384)	(0.4269)	(0.5334)	(0.5236)
Life expectancy (log)	0.0692				0.0571	0.0000	-0.0044
	(0.0831)				(0.0684)	(0.1072)	(0.1059)
Infant mortality (log)	0.3876					-1.6374	-1.6080
	(0.9282)					(1.8382)	(1.7846)
Food insecurity (%)	-0.0858						-0.0572
	(0.0844)						(0.1090)
First stage							
Political switching		0.5852***	0.5791***	0.5945***	0.5944***	0.5185***	0.5263***
		(0.1438)	(0.1447)	(0.1475)	(0.1483)	(0.1483)	(0.1428)
Observations	248	248	248	248	248	248	248
District and Year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (p-value)		0.0049	0.0053	0.0062	0.0057	0.0062	0.0089
KP Wald F-statistic		16.57	16.02	16.24	16.07	12.23	13.58

The table presents results from regression of the annual change in the log of recorded nighttime light density in each district for the period 1999 to 2013. The instrumental variable (political switching) is measured as the proportion of Members of Parliament (MPs) in a district that defect from the party with which they won their Parliamentary seat to join the ruling President's party. Columns 1-9 omit the two cities of Blantyre and Lilongwe (two districts, namely Neno and Likoma, are also excluded from the entire sample as they were recently formed after splitting from other districts). Columns 2-9 use the preferred sample and stepwise inclusion of control variables. Robust standard errors in all specifications are reported in parentheses. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.