The Journal of Development Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/fjds20

Aid and Local Growth in Malawi

Daniel Chris Khomba & Alex Trew

To cite this article: Daniel Chris Khomba & Alex Trew (2022) Aid and Local Growth in Malawi, The Journal of Development Studies, 58:8, 1478-1500, DOI: 10.1080/00220388.2022.2032668

To link to this article: https://doi.org/10.1080/00220388.2022.2032668

The Journal of Development Studies, 2022
Vol. 58, No. 8, 1478–1500, https://doi.org/10.1080/00220388.2022.2032668

Aid and Local Growth in Malawi

DANIEL CHRIS KHOMBA[*] & ALEX TREW[**]
[*]School of Economics and Finance, University of St. Andrews, St. Andrews, Scotland, [**]Adam Smith Business School, University of Glasgow, Glasgow, United Kingdom of Great Britain and Northern Ireland

(Original version submitted May 2019; final version accepted January 2022)

ABSTRACT *We study the local impact of foreign aid allocated to districts and constituencies 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 dataset that permits a novel instrumental variables strategy. We find a consistent and quantitatively significant relationship between aid and growth. Constituency-level regressions point to a larger effect than at district level, suggesting that aid is associated with some relocation of activity across space but not enough to make the net effect zero. The effect on growth is at its highest immediately after its disbursement, and falls to close to zero in subsequent years, implying that foreign aid has a level effect on incomes but does not stimulate sustained growth. Aid delivered as a grant is positively related with growth, while that given as a loan is not.*

KEYWORDS: Foreign aid; economic development; favoritism

1. Introduction

International development institutions, regional bodies and individual country agencies continue to allocate large sums in development aid to less developed countries. Between 2000 and 2014, net Official Development Assistance (ODA) of US$1.2 trillion was disbursed by donor countries, US$528.7 billion of which went to the Least Developed Countries.[1] Evidence to support the idea that such development assistance stimulates economic growth has been growing over the last decade.[2] Roodman (2007), however, has shown how fragile country-level estimates of the impact of aid can be. More recently, Galiani, Knack, Xu, and Zou (2017) found an economically and statistically significant role for aid in causing growth at the country level. Other work suggests there can be negative consequences for exports (Rajan & Subramanian, 2011), conflict (Nunn & Qian, 2014) or corruption (Svensson, 2000).[3]

Aid is not uniformly distributed within a recipient country. Given the importance of geography, and urbanization in particular, for growth, it could be informative to examine the disaggregated aid disbursement pattern and the spatially proximate consequences for growth.[4] In this paper we evaluate the effectiveness of aid flows to different regions (both parliamentary

Correspondence Address: Alex Trew, Adam Smith Business School, University of Glasgow, Glasgow, G12 8QQ, United Kingdom of Great Britain and Northern Ireland. Email: alex.trew@glasgow.ac.uk

Supplementary materials are available for this article which can be accessed via the online version of this journal available at http://dx.doi.org/10.1080/00220388.2022.2032668

constituencies and administrative districts) in Malawi over the period 1999–2013. Since aid is not randomly assigned, we introduce two arguably exogenous drivers of the internal distribution of development aid[5] 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. A general concern with this approach might be that President-influenced spending carries with it more than foreign aid alone. In the particular context of Malawi, however, 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 role for aid.

Our first instrument is a variable for *ethnic affinity* that is measured as the proportion 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; 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 appears to be unrelated to expected future growth. Using each of these instruments, and both combined, we find economically and statistically significant evidence on a positive relationship between aid and local 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). We show that the effect on growth occurs only at a lag of one year, with aid disbursed two or more years previously having no statistically significant impact. 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, Hodler, Raschky and Valsecchi (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.

While concerns about instrument exogeneity cannot be entirely allayed, a number of features of Malawi over our period of study help us alleviate some of 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.[6] 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, Powell, Findley, Baker, & Weaver, 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 intended for different purposes. 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.[7] 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, 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 & Dollar, 2000; Rajan & Subramanian, 2008) or bilateral relationships (Bjørnskov, 2013). However, these approaches suffer from possibly direct effects on growth (Bazzi & Clemens, 2013; Dreher, Klasen, Vreeland, & Werker, 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 et al. (2019) use an interaction between a country's crossing of the IDA threshold and a measure of the region's historical probability of receiving aid (Nunn and Qian, 2014). Dreher and Lohmann find no effect of aid when using this instrumental variable. Dreher, Eichgenauer, and Gehring (2018), 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. (2018) find that the effect of short-term political favoritism at a country level reduces the effectiveness of 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, Kramon, and Roberts (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, Rainer, and Trebbi (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).[8] The 2015 United Nations Human Development Index (HDI) ranked Malawi 173rd out of 186 countries.

2.1. *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[9] have contributed an average 40% of the national budget over the last decade (Malawi Government (2011)). Figure 1 depicts ODA[10] 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.

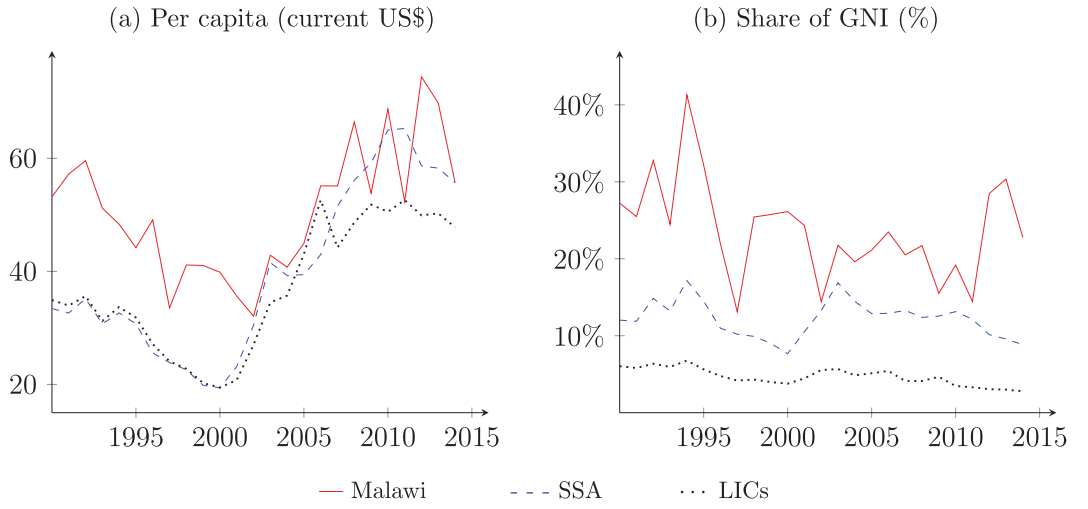

Figure 1. Net aid to Malawi and other regions.
Source: World Bank's World Development Indicators.

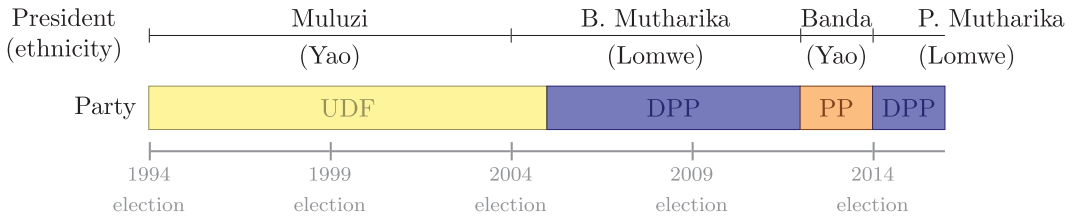

Figure 2. Timeline of recent Malawian politics.

2.2. 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.[11] Some of the resources of the State are in 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 (about twenty percent foreign assistance) and the development budget (around three quarters foreign aid). Recurrent budgets are disbursed by the National Local Government Finance Committee to district authority. This budget is thus much less under the influence of the President. The development budget is under the influence of the President, however. Development budget spending, in contrast, is controlled by the central government and subject to little oversight by parliament, aside from the national allocation to different objectives. In this spending, district authorities have no direct input into where development projects are implemented. The influence of the President over the local patterns of disbursement of aid is thus particularly strong in Malawi.

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).[12] In most specifications we omit those constituencies or districts that were recently formed or split.[13] 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

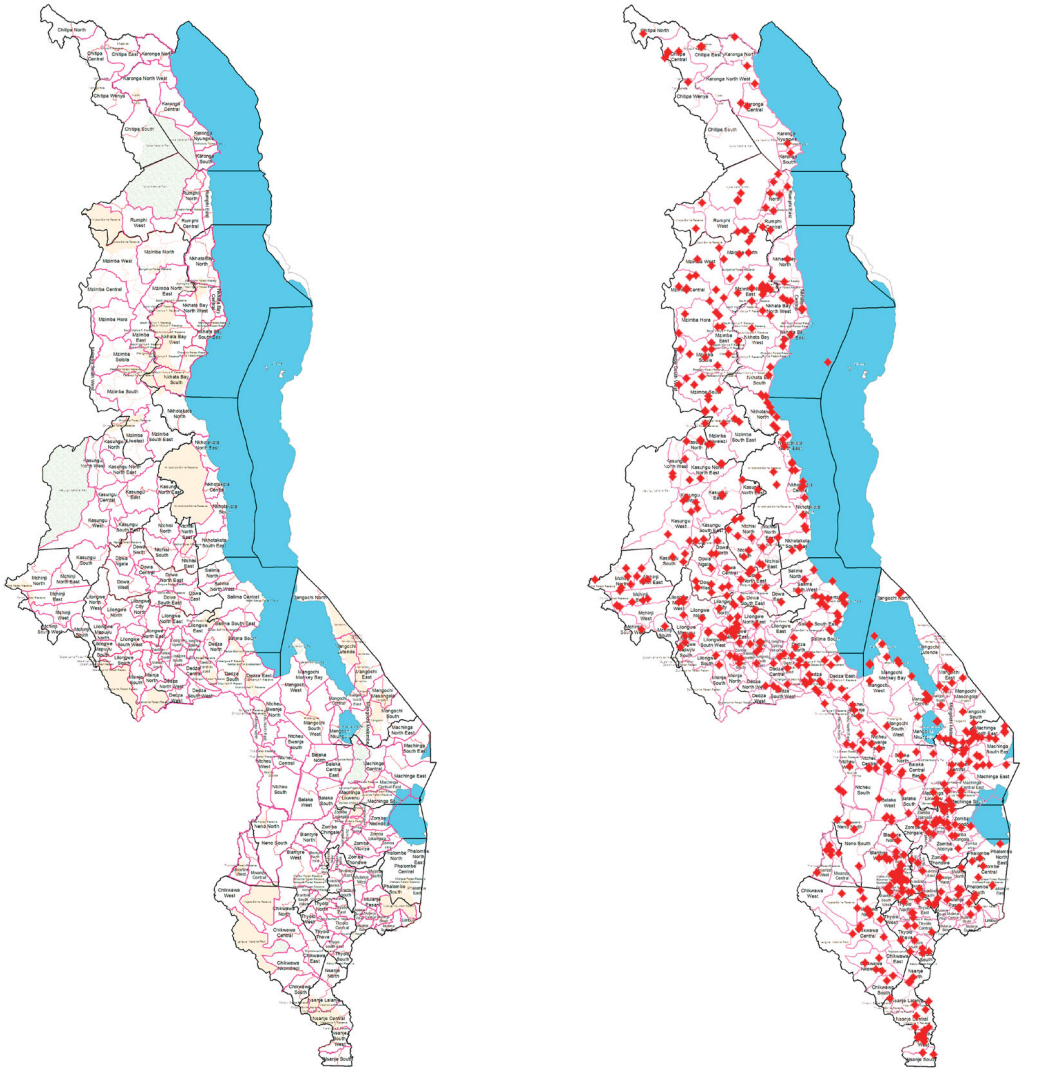

Figure 3. Boundaries (l) and locations of geocoded projects (r).

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.[14] Geographers (Elvidge, Kihn, Baugh, Kroehl and Davis, 1997; Sutton, Ghosh, & Elvidge, 2007) and ecologists (Doll, Muller, & Morley, 2006) first used light density to study urbanization. Chen and Nordhaus (2011) and Henderson, Storeygard, and Weil (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, Hsu, Baugh, & Ghosh, 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 Supplementary Appendix Table 9 we report

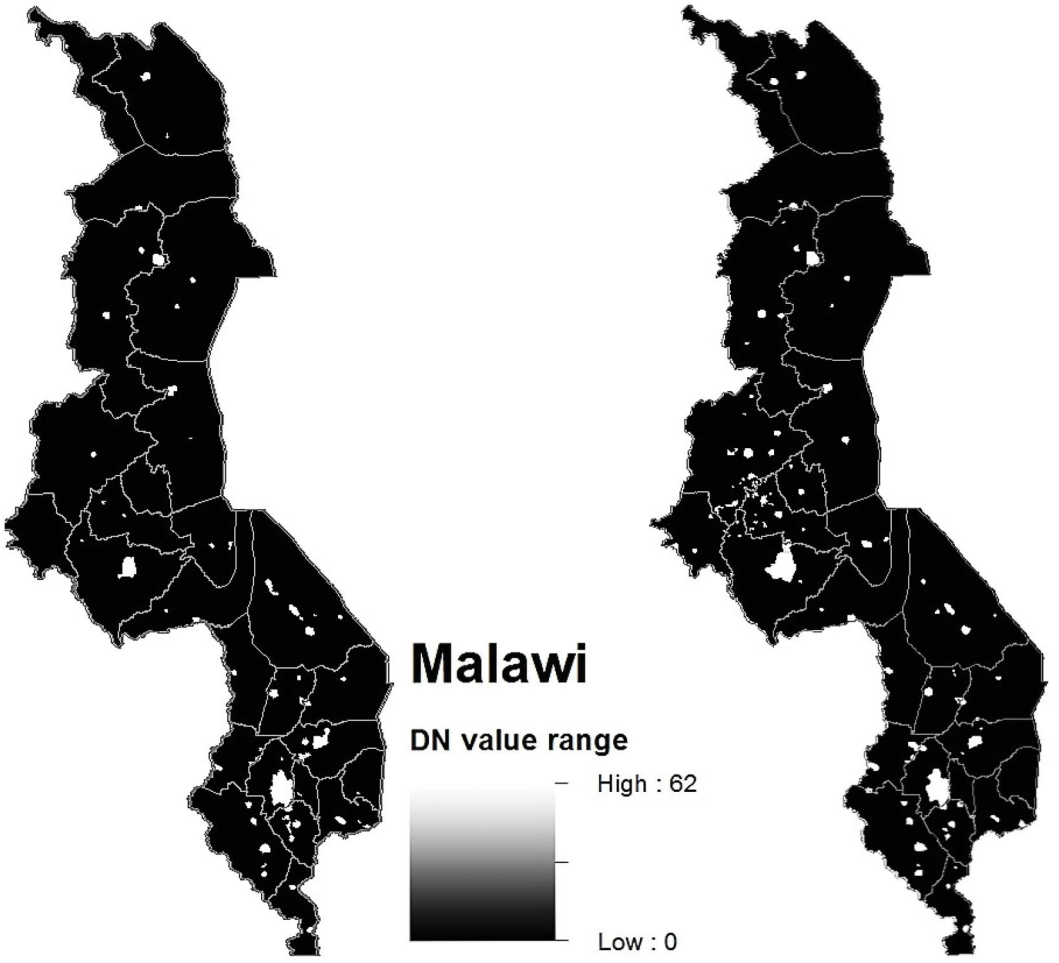

Figure 4. Nighttime images for Malawi in 1999 (left) and 2010 (right).

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.[15] 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. 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 shows

Table 1. District level descriptive statistics

	Obs	Mean	Std dev	Percentiles		
				25th	50th	75th
Light density growth	332	0.056	0.47	−0.23	0.02	0.30
Aid (log)	252	15.33	1.33	14.63	15.41	16.36
Public expenditures (log)	336	13.38	1.62	12.19	13.64	14.83
Population density (log)	336	4.77	0.65	4.32	4.82	5.16
Rainfall (log)	336	6.83	0.30	6.64	6.82	7.05
Poverty rate	336	57.95	13.05	47.85	59.60	67.20
Gross primary enrolment	335	11.51	0.60	11.18	11.48	11.89
Classroom buildings	335	6.86	0.40	6.62	6.82	7.08
Life expectancy	336	48.46	17.32	36.05	46.80	61.70
Infant mortality	336	4.44	0.33	4.25	4.401	4.55
Food insecurity rate	336	3.86	0.09	3.79	3.84	3.91
Ethnic affinity	336	0.27	0.31	0.01	0.09	0.61
Political switching	336	0.35	0.44	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.

descriptive statistics of the variables in the baseline sample (Supplementary Appendix Table 8 gives a summary of the data used in the analysis and their sources).

4. Empirical strategy

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

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

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 real aid disbursements, $\mathbf{X}$ is a vector of control variables and μ_i and γ_t are constituency/district and time fixed effects. The specification in (1) includes a lagged dependent variable, $LD_{i,t-1}$, in order to capture convergence in growth regression (Durlauf, Johnson, & Temple, 2005). 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,

$$\Delta LD_{i,t} = \beta_0 + \beta_1 L\, D_{i,t-1} + \beta_2 \widehat{Aid}_{i,t-1} + \mathbf{X}'_{i,t-1}\beta + \mu_i + \gamma_t + \varepsilon_{i,t}, \quad (2)$$

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

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.

A final concern in a dynamic specification with fixed effects arises due to the possibility of Nickell (1981) bias. As Barro (2016) notes, we may reduce some of this bias with a long time dimension. In our case, this is not possible, due to data constraints. As a robustness exercise we thus report, in an appendix, regression results without each type of fixed effect.

4.1. *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. The Malawi Human Rights Commission (2005) finds that there are around 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 co-ethnic voting behavior. There is a large literature on the role of ethnicity in African voting (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. Studies in Ghana (Lindberg & Morrison, 2008) and South Africa (Anyangwe, 2012) find no or very limited

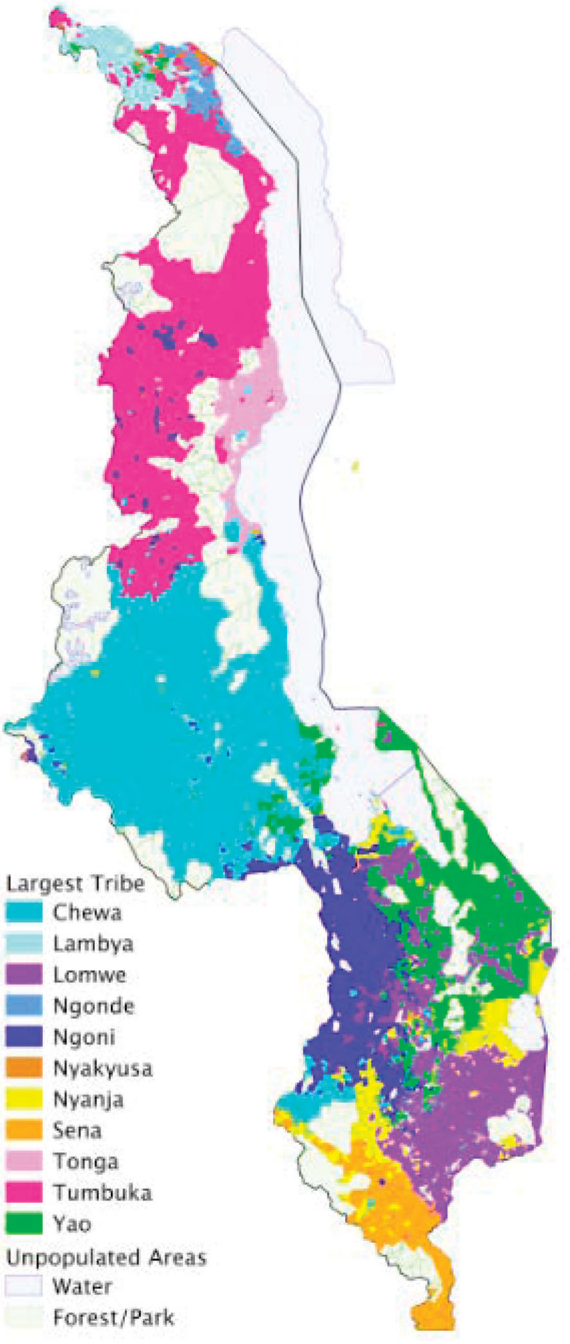

Figure 5. Spatial distribution of ethnic groups in Malawi.
Source: Figure from Robinson (2016)

evidence that voting is subsumed in ethnicity. For Malawi, we report in Supplementary Appendix Table 11 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

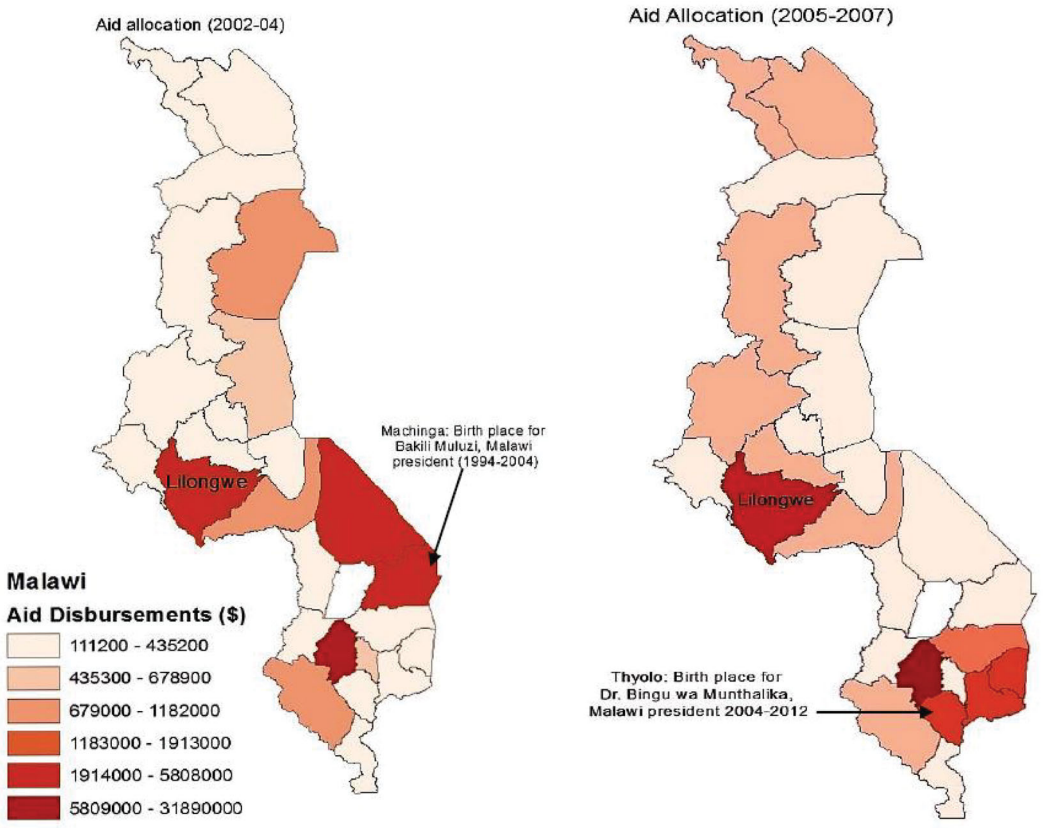

Figure 6. Allocation of aid under two Presidencies.

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.

4.2. 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 regions dominated by opposition parties (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.[16] 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 in part by the promise of personal gains (i.e., public office). 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 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 2 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 (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

Table 2. 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.

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

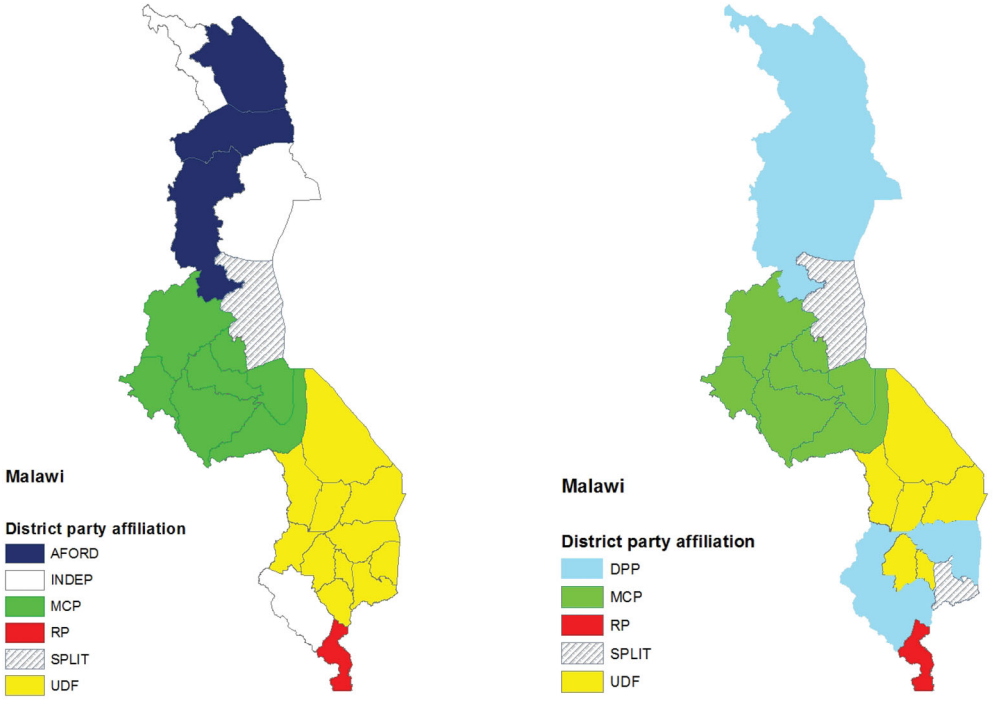

Figure 7. Map of political change in Malawi between 2004 and 2005

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 2 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 3 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 district level and then at constituency level. Regressions at district level permit a range of extensions, which we introduce in Section 6. Constituency level regressions benefit from a larger cross section and the ability to cluster standard errors at the district level but limits the set of control variables (in particular, we cannot control for the level of other expenditures at the constituency level).

Table 3. Constituency results with both instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
Aid (log)	0.1131***	0.6321***	0.6316***	0.6333***	0.6405***	0.6322***
	(0.0402)	(0.1155)	(0.1182)	(0.1237)	(0.1288)	(0.1296)
Light density (log)	−0.4320***	−0.8765***	−0.8768***	−0.8687***	−0.8734***	−0.8696***
	(0.0456)	(0.1113)	(0.1112)	(0.1145)	(0.1180)	(0.1187)
Population (log)	0.1876		0.1222	0.3409	0.3031	0.3848
	(1.1069)		(1.5435)	(1.4759)	(1.4978)	(1.4479)
Poverty rate (%)	0.0005			0.0039	0.0041	0.0040
	(0.0027)			(0.0033)	(0.0034)	(0.0034)
Rainfall (log)	−0.0834				0.0529	0.0491
	(0.1367)				(0.1214)	(0.1225)
Minister (dummy)	0.0603*					0.0725**
	(0.0322)					(0.0348)
First stage						
Ethnic affinity		0.4834***	0.4900***	0.4629***	0.4627***	0.4663***
		−0.1378	−0.1435	−0.1326	−0.1317	−0.1338
Political switching		0.3275***	0.3276***	0.3362***	0.3281***	0.3308***
		−0.0674	−0.0677	−0.0679	−0.0669	−0.0665
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)		0.000437	0.000409	0.000414	0.000484	0.000621
KP Wald *F*-statistic		21.07	19.16	19.97	20.19	20.16
Hansen J (*p*-value)		0.714	0.71	0.538	0.568	0.564

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 2–6 use the preferred sample and stepwise inclusion of control variables. Robust standard errors, clustered at district level, are reported in parentheses: $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

5.1. District results

Table 4 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 2–7. The statistical significance of the ethnic affinity instrument in the first stage regression is strong in all specifications; that for political switching is less strong when combined with ethnic affinity. 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. 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 & Lohmann, 2015 and Galiani et al., 2017).

Public expenditure (excluding foreign aid) is only weakly significant, and where it is the coefficient is negative, 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

Table 4. District results with both instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Aid (log)	0.0438*	0.2263***	0.2241***	0.2146***	0.2141***	0.2176***	0.2172***
	(0.0241)	(0.0586)	(0.0590)	(0.0544)	(0.0532)	(0.0579)	(0.0568)
Light density (log)	−0.8202***	−0.9647***	−0.9661***	−0.9738***	−0.9869***	−0.9825***	−0.9825***
	(0.0892)	(0.0749)	(0.0750)	(0.0726)	(0.0747)	(0.0767)	(0.0769)
Public expenditure (log)	0.0810	−0.0838**	−0.0856**	−0.0758*	−0.0853*	−0.0861*	−0.0857*
	(0.1265)	(0.0369)	(0.0374)	(0.0406)	(0.0454)	(0.0455)	(0.0454)
Population (log)	1.4546	1.4135*	1.4528*	1.5051**	0.6821	0.5570	0.5722
	(0.9191)	(0.7687)	(0.7852)	(0.7596)	(1.0422)	(1.0620)	(1.0434)
Rainfall (log)	0.0233	0.0135	0.0140	0.0166	0.0215	0.0237	0.0239
	(0.0765)	(0.1230)	(0.1230)	(0.1185)	(0.1200)	(0.1204)	(0.1200)
Poverty rate (%)	−0.0025	0.0037	0.0037	0.0037	0.0032	0.0032	0.0032
	(0.0034)	(0.0051)	(0.0051)	(0.0050)	(0.0052)	(0.0052)	(0.0052)
Primary enrolment (log)	0.1326		0.0233	0.2264	0.3053**	0.3016**	0.3005**
	(0.2412)		(0.0162)	(0.1486)	(0.1358)	(0.1314)	(0.1315)
Classroom buildings (log)	0.4576			−0.5213	−0.5142	−0.5540	−0.5543
	(0.3402)			(0.4075)	(0.3974)	(0.4111)	(0.4112)
Life expectancy (log)	0.2017				0.0568	0.0378	0.0371
	(0.1762)				(0.0628)	(0.0756)	(0.0769)
Infant mortality (log)	0.0967					−0.5378	−0.5403
	(0.7357)					(0.8848)	(0.9047)
Food insecurity (%)	−0.0226						−0.0062
	(0.0716)						(0.0772)
First stage							
Ethnic affinity		1.5774***	1.5571***	1.6185***	1.6022***	1.5488***	1.5490***
		(0.1727)	(0.1726)	(0.1915)	(0.1925)	(0.1868)	(0.1873)
Political switching		0.2075	0.2070	0.2294*	0.2364*	0.1976*	0.1958*
		(0.1376)	(0.1376)	(0.1362)	(0.1286)	(0.1194)	(0.1123)
Observations	248	248	248	248	248	248	248
District and year FE	Y	Y	Y	Y	Y	Y	Y
AR F-test (*p*-value)		0.00401	0.00442	0.00506	0.00368	0.00307	0.00305
KP Wald *F*-statistic		67.78	65.37	47.65	43.44	40.38	40.75
Hansen J (*p*-value)		0.0394	0.0382	0.0410	0.0362	0.0323	0.0342

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 1999–2013. 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 1–7 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 2–7 use the preferred sample and stepwise inclusion of control variables. Robust standard errors are reported in parentheses. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

population density grow faster, which is consistent with the literature on urbanization and development (see Desmet & 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 0.03 and 0.04, so we fail to reject the over-identifying restriction at the 1% level. The political switching instrument has less variation at the district level, since it is an average of constituency switches. For robustness, we report results from regressions using only the ethnic affinity instrument are in Supplementary Appendix Table 12; that from using only the political switching instrument are in Supplementary Appendix Table 13. Anderson-Rubin and KP statistics show that the instruments also perform strongly individually.

Our preferred specification is that in Column 7 of Table 4. This implies that a 10% increase in aid disbursed to a district is associated with an increase in light density of 2.2% per year, which is smaller than in constituency regressions. The difference in the size of the coefficient may result from aid leading to some movement of economic activity *across* constituencies *within* a district. Since the standard deviation of the log of aid is 1.33, the effect of a one standard deviation increase in aid disbursement is to increase light density by 29.2%. The effect of aid on growth is, in absolute terms, quantitatively important for short-run growth.

Given a concern for potential Nickell (1981)-type bias, Supplementary Appendix Tables 16–18 report the district level regressions with each independent fixed effects, and with none. As can be seen, when we omit the year fixed effect, the coefficient on the lag of aid is positive and statistically significant. Omitting the district fixed effect reduces the coefficient and, while the point estimate is still positive, it is statistically insignificant. As will be seen in the constituency level regressions below, there coefficient on the lag of aid falls as the unit of analysis becomes larger, most likely due to some reallocation of activity across constituencies within a district. Given that the district level regression coefficients are initially lower, the effect of removing district fixed effects, and potentially removing some part of the Nickel bias, has the consequence of making the coefficients insignificant. Where the coefficients are more locally observed, as in the constituency results, this insignificance does not arise.

5.2. *Constituency results*

Table 3 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 2–6.

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 Supplementary Appendix Table 14; that from using only the political switching instrument are in Supplementary Appendix Table 15. 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 4. This implies that a 10% increase in aid disbursed to a constituency is associated with an increase in light density of 6.32% 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 important.

Again, we report in Supplementary Appendix Tables 19–21 the constituency level regressions with each independent fixed effects, and with none. In this setting, the removal of all fixed effects, while moving the coefficient in the same direction as in the district regressions, results in coefficients on the lag of aid that remain statistically significantly different from zero. While these and the district results indicate the potential presence of a Nickell-type bias, that bias is not behind the power of the lag of aid to explain future growth in light density.

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.

6.1. 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 our main regression, but include lags of aid disbursement up to five years, with associated lags of the instrumental variables up to the same lag. We report results in Table 5 based on the specifcation in Table 4 with the full set of controls (column 7). The results suggest that the response of growth to an increase in aid flows occurs principally in the year of its disbursement, with aid disbursed more than one year previously having no discernible impact. Since the boost to growth occurs only one time, and is not persistent, this suggests a long-run level effect on income, rather than a long-run growth effect. The coefficient on the first lag of aid is statistically significant in all specifications except where we add all lags up to the full five years of aid. Since the coefficient does not change greatly, we put this down to the impact of the declining the sample size on the precision of the estimator.

6.2. Project type

Some aid projects in the AMP include information on the targeted outcome for the funding. Table 6 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

Table 5. Lags of aid (district level)

	(1)	(2)	(3)	(4)	(5)
Aid_{t-1} (log)	0.2172***	0.1632**	0.2746***	0.2319**	0.2039
	(0.0568)	(0.0645)	(0.0674)	(0.0987)	(0.1367)
Aid_{t-2} (log)		0.0952	−0.0393	0.0786	0.0810
		(0.1356)	(0.1626)	(0.1907)	(0.1823)
Aid_{t-3} (log)			0.0436	−0.0333	−0.0800
			(0.1292)	(0.1076)	(0.1085)
Aid_{t-4} (log)				−0.0466	−0.1448
				(0.0877)	(0.0901)
Aid_{t-5} (log)					0.1408
					(0.1382)
Light density (log)	−0.9825***	−1.1167***	−1.2779***	−1.2694***	−1.2738***
Observations	248	209	181	158	134
District-year FE	Y	Y	Y	Y	Y
AR F-test (*p*-value)	0.00305	0.00700	0.00423	0.00448	1.78e − 06
KP Wald *F*-statistic	40.75	3.256	3.662	5.039	1.374
Hansen J (*p*-value)	0.0342	0.0551	0.343	0.179	0.178

Notes: The table presents results from regression of the change from time $(t-1)$ to t in the log of recorded nighttime light density in each district for the period 1999–2013 on the lag of aid. All regressions use the specification with the full set control variables (column 7 in Table 3; coefficients not reports). Both instrumental variables are used up to and including the lag in log of aid. 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 1-5 reports results on the effect of aid with variables lagged as specified in row label, with lags of instrumental variables not reported. Robust standard errors are reported in parentheses. $^{***}p<0.01$, $^{**}p<0.05$.

economy. The growth impact of aid for education and health projects is lower, though it remains statistically significant at the 10% level. We cannot distinguish growth in different sectors, but while the results on the impact of agricultural projects on growth in light density is positive, this is potentially represents a slowing of structural transformation toward faster-growing, non-agricultural activity (Ahlerup, 2019). That being said, in a formal test of the restriction, we cannot reject the null that the coefficients are equal.

6.3. Funding type

Table 7 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 7 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. However, as with the project types, this is only suggestive as we we cannot reject the null that the coefficients are equal.

7. Concluding remarks

In focusing the disbursement of aid within one country, we have developed a new way of considering the relationship between the flow of aid and the rate of growth. We have shown that there is a robust and qualitatively significant relationship between aid and contemporaneous growth, which is significant at a lag of only one year. The difference between the constituency and district results suggest that aid is associated with a significant relocation of activity across space but that, nevertheless, the effect overall is positive.

Table 6. Regression results by aid sector

Sector:	(1) Agriculture	(2) Education	(3) Health
Aid to sector (log)	0.5913***	0.3190*	0.1149**
	(0.2058)	(0.1722)	(0.0578)
Light density (log)	−1.0130***	−1.3202***	−1.2672***
	(0.2088)	(0.0998)	(0.0638)
Public expenditure (log)	−0.5701***	−0.0378	−0.0631
	(0.1953)	(0.0665)	(0.0505)
Population (log)	−1.5372	4.4880**	3.2391**
	(2.5001)	(2.2340)	(1.4543)
Rainfall (log)	0.0879	−0.1032	−0.1758
	(0.1861)	(0.1628)	(0.1585)
Poverty rate (%)	0.3255	0.0811	−0.5371**
	(0.4991)	(0.3173)	(0.2263)
Primary enrolment (log)	1.2173	−0.1154	−0.1241
	(1.0814)	(0.3434)	(0.2668)
Classroom buildings (log)	−0.4318	−0.1420	0.2981
	(0.6269)	(0.4649)	(0.4710)
Life expectancy (log)	14.2967	−10.7039	−2.0071
	(8.9056)	(10.9094)	(6.5684)
Infant mortality (log)	−1.8675	−2.0044	−0.8702
	(1.8285)	(2.1707)	(1.6128)
Food insecurity (%)	−0.2322	0.0962	−0.0879
	(0.2395)	(0.1279)	(0.1763)
First stage			
Ethnic affinity	0.5152	0.7171	0.9943
	(0.4689)	(0.4882)	(0.6687)
Political switching	0.1945	0.1166	0.9313**
	(0.2324)	(0.3279)	(0.3766)
Observations	265	195	188
AR *F*-test (*p*-value)	0.000136	0.0605	0.280
KP Wald *F*-statistic	3.851	5.923	7.433
Hansen J (*p*-value)	0.695	0.675	0.661

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 1999–2013. 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. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

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 be considered in other countries. Malawi is among the poorest of the LICs, but the apparent positive relationship between aid and 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.

Table 7. Regression results for estimation using types of aid

Aid type:	(1) Grants	(2) Loans	(3) Multilateral	(4) Bilateral
Aid of type (log)	0.2701**	0.1596	0.1731**	0.2416**
	(0.1189)	(0.1055)	(0.0847)	(0.1051)
Light density (log)	−1.2014***	−1.2360***	−1.1915***	−1.1610***
	(0.0880)	(0.0804)	(0.0856)	(0.0812)
Public expenditure (log)	−0.0244	−0.0311	−0.0462	0.0335
	(0.0469)	(0.0444)	(0.0471)	(0.0510)
Population (log)	1.1343	3.2784***	1.4490	2.0429
	(1.4002)	(1.1866)	(1.4070)	(1.2579)
Rainfall (log)	−0.1280	−0.1680*	−0.1445	−0.0449
	(0.1073)	(0.0988)	(0.1458)	(0.1364)
Poverty rate (%)	−0.2795	−0.3412	−0.2119	−0.2876
	(0.2558)	(0.2618)	(0.3131)	(0.2046)
Primary enrolment (log)	−0.2469	−0.0649	0.1419	−0.3519
	(0.2574)	(0.2067)	(0.1775)	(0.2767)
Classroom buildings (log)	0.7814*	0.3118	0.0400	0.7346*
	(0.4141)	(0.4556)	(0.4658)	(0.4432)
Life expectancy (log)	−0.4831	−0.0690	3.7053	−3.8959
	(6.2049)	(6.3156)	(4.2550)	(6.4948)
Infant mortality (log)	−1.4170	−0.5346	−0.4642	−0.4966
	(1.8379)	(1.7516)	(1.6021)	(1.3336)
Food insecurity (%)	−0.0744	−0.0116	−0.1231	−0.2555*
	(0.1137)	(0.1100)	(0.1426)	(0.1468)
First stage				
Ethnic affinity	0.8579**	0.9653***	0.5846*	1.0641**
	(0.3617)	(0.2721)	(0.3078)	(0.4551)
Political switching	0.2046	0.3369**	0.7142***	−0.0758
	(0.2697)	(0.1448)	(0.1884)	(0.2687)
Observations	226	212	220	211
District and year FE	Y	Y	Y	Y
AR F-test (*p*-value)	0.0611	0.327	0.142	0.0472
KP Wald *F*-statistic	5.476	13.42	21.84	2.753
Hansen J (*p*-value)	0.611	0.780	0.443	0.140

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 1999–2013. 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. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Acknowledgement

We are grateful to the Editor and two anonymous referees whose comments have improved this paper, as well as 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.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

Khomba thanks the University of St. Andrews for PhD funding through a 600th Year Celebration Scholarship.

Notes

1. Data reported in constant 2014 prices and obtained from OECD's Development Co-operation Report 2015.
2. See, for example, Boone (1996), Easterly, Levine, and Roodman (2004), Rajan and Subramanian (2008), Doucouliagos and Paldam (2009), Dalgaard and Hansen (2010), Arndt, Jones, and Tarp (2010), Dreher and Lohmann (2015).
3. See Qian (2015) for an excellent recent survey. Some recent developments in the macroeconomics of aid are introduced in Addison, Morrissey, and Tarp (2017).
4. Recent evidence suggests that local effects of aid can be important (Dreher et al., 2021).
5. Throughout, by 'aid' we refer to non-humanitarian/food aid.
6. Data from Ministry of Finance's annual Financial Statements.
7. See Henderson et al. (2012), Michalopoulos and Papaioannou (2013), Lowe (2014) and Storeygard (2016).
8. Data from Malawi National Statistical Office (NSO), World Bank, and the Human Development Report (2015).
9. 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.
10. 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.
11. For Malawi, see Booth et al. (2006), Cammack (2007). More generally, Francois et al. (2015) finds that ruling coalitions across Africa are large and that power is proportionately allocated.
12. Supplementary Table 8 gives all data and sources used. Supplementary Table 10 lists all the districts in Malawi.
13. 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.
14. The light dataset is available at the National Geophysical Data Center's website: http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html.
15. Maps for administrative districts are downloaded from DIVA-GIS, available at http://www.diva-gis.org/gdata
16. See Joseph (1987), Van de Walle (2007), Arriola (2009).

ORCID

Alex Trew http://orcid.org/0000-0001-8689-9480

References

Addison, T., Morrissey, O., & Tarp, F. (2017). The macroeconomics of aid: Overview. *The Journal of Development Studies*, 53(7):987–997. doi:10.1080/00220388.2017.1303669

Ahlerup, P. (2019). Foreign aid and structural transformation: Micro-level evidence from Uganda (Working Paper 755). Gothenburg: University of Gothenburg.

Alesina, A. & Dollar, D. (2000). Who gives foreign aid to whom and why? *Journal of Economic Growth*, *5*(1):33–63. doi:10.1023/A:1009874203400

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. doi:10.1080/18186874.2013.774697

Arndt, C., Jones, S., & 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. doi:10.1177/0010414009332126

Barro, R. (2016). *Economic growth and convergence, applied especially to China* (Technical Report w21872). Cambridge, MA: National Bureau of Economic Research.

Bazzi, S. & Clemens, M. A. (2013). Blunt instruments: Avoiding common pitfalls in identifying the causes of economic growth. *American Economic Journal: Macroeconomics*, *2*(5):152–186. doi:10.1257/mac.5.2.152

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

Boone, P. (1996). Politics and the effectiveness of foreign aid. *European Economic Review*, *40*(2):289–329. doi:10.1016/0014-2921(95)00127-1

Booth, D., Cammack, D., Harrigan, J., Kanyongolo, E., Mataure, M., & Ngwira, N. (2006). *Drivers of change and development in Malawi* (ODI Working Paper (261)). London: Overseas Development Institute.

Briggs, R. C. (2012). Electrifying the base? Aid and incumbent advantage in Ghana. *The Journal of Modern African Studies*, 50(04):603–624. doi:10.1017/S0022278X12000365

Burnside, C. & Dollar, D. (2000). Aid, policies, and growth. *American Economic Review*, *90*(4):847–868. doi:10.1257/aer.90.4.847

Cammack, D. (2007). The logic of African neopatrimonialism: What role for donors? *Development Policy Review*, *25*(5):599–614. doi:10.1111/j.1467-7679.2007.00387.x

Chen, X. & Nordhaus, W. (2011). Using luminosity data as a proxy for economic statistics. *The Proceedings of National Academy of Science*, *108*(21):8589–8594.

Dalgaard, C.-J. & Hansen, H. (2010). *Evaluating aid effectiveness in the aggregate: A critical assessment of the evidence*. MPRA Paper 23026. Germany: University Library of Munich.

De Luca, G., Hodler, R., Raschky, P. A., & Valsecchi, M. (2018). Ethnic favoritism: An axiom of politics? *Journal of Development Economics*, 132:115–29. doi:10.1016/j.jdeveco.2017.12.006

Desmet, K. & Henderson, J. V. (2015). The geography of development within countries. In G. Duranton, J. V. Henderson, & W. Strange. *Handbook of regional and urban economics*, Chapter 22. Elsevier.

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

Doll, C. N., Muller, J.-P., & Morley, J. G. (2006). Mapping regional economic activity from night-time light satellite imagery. *Ecological Economics*, *57*(1):75–92. doi:10.1016/j.ecolecon.2005.03.007

Doucouliagos, H. & Paldam, M. (2009). The aid effectiveness literature: The sad results of 40 years of research. *Journal of Economic Surveys*, *23*(3):433–461. doi:10.1111/j.1467-6419.2008.00568.x

Dreher, A. and Lohmann, S. (2015). Aid and growth at the regional level. *Oxford Review of Economic Policy*, 31(3–4):420–446. doi:10.1093/oxrep/grv026

Dreher, A., Eichgenauer, V., & Gehring, K. (2018). Geopolitics, aid and growth: The impact of UN Security Council membership on the effectiveness of aid. *World Bank Economic Review*, *32*(2):268–286. doi:10.1093/wber/lhw037

Dreher, A., Fuchs, A., Hodler, R., Parks, B. C., Raschky, P. A., & Tierney, M. J. (2019). African leaders and the geography of China's foreign assistance. *Journal of Development Economics*, 140:44–71.

Dreher, A., Fuchs, A., Hodler, R., Parks, B. C., Raschky, P. A., & Tierney, M. J. (2021). Is favoritism a threat to Chinese aid effectiveness? A subnational analysis of Chinese development projects. *World Development*, 139:105291.

Dreher, A., Klasen, S., Vreeland, J. R., & Werker, E. (2013). The costs of favoritism: Is politically driven aid less effective? *Economic Development and Cultural Change*, *62*(1):157–191. doi:10.1086/671711

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.

Durlauf, S. N., Johnson, P. A., & Temple, J. R. W. (2005). Chapter 8 Growth Econometrics. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of economic growth*, volume 1, pp. 555–677. Elsevier.

Easterly, W., Levine, R., & Roodman, D. (2004). New data, new doubts. *American Economic Review*, *94*(3):774–780. doi:10.1257/0002828041464560

Elvidge, C. D., Hsu, F.-C., Baugh, K. E., & Ghosh, T. (2014). National trends in satellite-observed lighting 1992–2012. In Q. Weng (Ed.), *Global urban monitoring and assessessment through earth observation*, chapter 6, pp. 97–120. Boca Raton: Imprint CRC Press.

Elvidge, C.D., Kihn, E.A., Baugh, K.E., Kroehl, H., & 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. & 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. doi:10.1017/S0003055412000172

Francois, P., Rainer, I., & Trebbi, F. (2015). How is power shared in Africa? *Econometrica*, *83*(2):465–503. doi:10.3982/ECTA11237

Galiani, S., Knack, S., Xu, L. C., & Zou, B. (2017). The effect of aid on growth: Evidence from a quasi-experiment. *Journal of Economic Growth*, *22*:1–33.

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., & Weil, D. N. (2012). Measuring economic growth from outer space. *American Economic Review*, *102*(2):994–1028. doi:10.1257/aer.102.2.994

Hodler, R. & Raschky, P. A. (2014). Regional favoritism. *The Quarterly Journal of Economics*, *129*(2):995–1033. doi:10.1093/qje/qju004

Jablonski, R. S. (2014). How aid targets votes: The impact of electoral incentives on foreign aid distribution. *World Politics*, *66*(2):293–330. doi:10.1017/S0043887114000045

Joseph, R. A. (1987). Democracy and prebendal politics in Nigeria: The rise and fall of the second republic. *The Journal of Modern African Studies*, *27*(4), 718–721.

Lindberg, S.I. & Morrison, M.K.C. (2008). Are African voters really ethnic or clientelistic? Survey evidence from Ghana. *Political Science Quarterly 123*(1):95–122. doi:10.1002/j.1538-165X.2008.tb00618.x

Lowe, M. (2014). *Rail revival in Africa? The impact of privatization*. Presented at Joint RES-SPR Conference on "Macroeconomic Challenges Facing Low-Income Countries". Washington DC: International Monetary Fund. 27 pp. + 15 pp. (Appendices) pp.

Malawi Government. (2011). Malawi aid atlas, 2011 fiscal year (Technical report). Lilongwe: Ministry of Finance.

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

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

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, *49*(6):1417–1426. doi:10.2307/1911408

Nunn, N. & Qian, N. (2014). U.S. food aid and civil conflict. *American Economic Review*, *104*(6):1630–1666. doi:10.1257/aer.104.6.1630

Peratsakis, C., Powell, J., Findley, M., Baker, J., & 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: Cambridge University Press.

Qian, N. (2015). Making progress on foreign aid. *Annual Review of Economics*, *7*:277–308.

Rajan, R. G. & Subramanian, A. (2008). Aid and growth: What does the cross country evidence really show? The *Review of Economics and Statistics*, *90*(4):643–665. doi:10.1162/rest.90.4.643

Rajan, R. G. & Subramanian, A. (2011). Aid, Dutch disease, and manufacturing growth. *Journal of Development Economics*, *94*:106–18.

Rajlakshmi, D. & Becker, C. (2015). The foreign aid effectiveness debate: Evidence from Malawi (AidData Working Paper #6). Williamsburg, VA: AidData.

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

Roodman, D. (2007). The anarchy of numbers: Aid, development and cross-country empirics. *The World Bank Economic Review*, *21*(2):255–277. doi:10.1093/wber/lhm004

Storeygard, A. (2016). Farther on down the road: Transport costs, trade and urban growth in Sub-Saharan Africa. *Review of Economic Studies*, *83*(3):1263–1295. doi:10.1093/restud/rdw020

Sutton, P. C., Ghosh, T., & 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):5–21.

Svensson, J. (2000). Foreign aid and rent-seeking. *Journal of International Economics*, *51*(2):437–461. doi:10.1016/S0022-1996(99)00014-8

Temple, J. & 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 H. Kischelt, & S. I. Wilkinson (Eds.), *Patrons, clients and policies: Patterns of democratic accountability and political competition* (pp. 50–67). Cambridge: Cambridge University Press.

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