Aiding Digital Repression: Chinese Communication Aid and Media Freedom

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Abstract

Previous studies suggest that foreign aid enhances media freedom in recipient countries because the conditionality imposed by Western donors induces recipient countries to implement political and economic reforms with positive spillover effects on the recipients' media environment. In the past two decades, however, China has become a leading country of digital authoritarianism and a major international donor. China also allocates its aid without imposing hard conditionality on recipient countries. In this article, we argue that developing countries have a strong incentive to learn the statecraft of media repression from China to monitor and censor their citizens' behavior in the digital realm. Meanwhile, China spreads its digital technology via its aid to those countries . As a result, we hypothesize that China's aid in communication sectors increases digital repression and suppresses media freedom in recipient countries. Data analysis of 111 countries from 2002 to 2017 confirms our hypotheses. Our findings are robust to alternative model specifications and contribute to the ongoing research agenda on the perils of Chinese foreign aid and the diffusion of digital authoritarianism.

Keyword: Foreign Aid, Chinese Aid, Media Freedom, Digital Authoritarianism, Digital Repression,

Introduction

Defined as "the use of digital information technology by authoritarian regimes to surveil, repress, and manipulate domestic and foreign populations" (Polyakova and Meserole 2019), digital authoritarianism has attracted tremendous attention among scholars and political observers because it helps autocrats to suppress their opponents and civil society (Chang and Lin 2020; Kendall-Taylor, Frantz, and Wright 2020), violate the protection of human rights (Dragu and Lupu 2021), and lengthens their political survival (Guriev and Treisman 2019). As a result, many autocracies are gearing up to strengthen their digital capacity by learning from bellwethers of digital authoritarianism, China and Russia in particular (Polyakova and Meserole 2019). According to a report of the Freedom House (2018), the worldwide spread of digital authoritarianism has led to significant declines in internet freedom in 26 out of 65 countries assessed in the study. Also, the report maintains that China, a resilient dictatorship with advanced information technology to control its civil society tightly, is "cultivating media elites and government ministers around the world to create a network of countries that will follow its lead on internet policy." In other words, China's digital authoritarianism has allegedly "gone global" after it expands its political, economic, and technological networks with developing countries (Freedom House 2022; Taylor 2022).

Although China is regarded as a key spreader of global digital authoritarianism, there is no systematic investigation into this issue. In particular, the perspective on the expansion of Chinese digital authoritarianism suffers two limitations. First, existing studies rely on a few cases to illustrate the role of China in enhancing other countries' repression on media freedom. Relying on these "positive cases," researchers may commit a selection bias and overestimate the influence of China on other countries' media freedom. Second, existing studies are limited in describing the channels through which China can successfully spread its digital statecraft and influence other countries' media environments. For instance, China may not intend to export its digital authoritarian to countries in the first place. Instead, other counties would like to

increase their digital capacity to suppress civil society by importing digital technology and infrastructure from China as well as other countries. In other words, China may not be solely responsible for the media repression in foreign countries.

In this article, we aim to fill in both gaps by comprehensively evaluating a specific means for China to spread its digital statecraft to other countries: foreign aid. As China strategically allocates its foreign aid to the developing world (Dreher et al. 2019; Harchaoui, Maseland, and Watkinson 2021), we argue that Chinese aid in communication sectors helps recipient countries to become more capable of repressing the media in their countries. As a result, countries receiving more Chinese aid in communication sectors would have more repression of digital media and lower media freedom. To test our argument, we analyze the data of 111 countries from 2002 to 2017. We find that Chinese communication aid increases digital repression and thus reduces media freedom in recipient countries. Meanwhile, we do not find evidence to show that communication aid from Western countries is correlated with digital repression or media freedom of recipient countries. Our findings are robust to alternative model specifications that address the issue of endogeneity.

This article has two contributions. First, it joins the emerging literature on the perils of Chinese aid by showing that China's communication aid enhances digital authoritarianism in recipient countries. Thus, it will enrich the understanding of the diffusion of China's digital authoritarianism and clarify China's leading role in the new wave of "autocratization." Second, it will help democratic countries to find effective ways to counter China's influences over third countries and prevent themselves from "democratic backsliding." For instance, the international community may require China to impose conditionality on recipient countries of its aid and be more transparent in its foreign aid allocation. Meanwhile, other countries may help strengthen civil society's capacity to resist digital authoritarianism funded by China.

The rest of the paper is organized as follows. In the next section, we elaborate on our hypotheses about the relationship between Chinese communication aid and media repression.

The empirical section describes our research design and uses empirical data to test our hypotheses. The final section discusses the implications of our findings and provides concluding remarks.

Argument

Foreign Aid and Media Freedom

Previous studies have investigated the effect of foreign aid on media freedom in recipient countries. Dutta and Williamson (2016) argue that the conditionality imposed by aid donors induces political and economic reforms in recipient countries. In particular, aid conditionality requires recipient countries to implement political and economic reforms. These reforms will enhance media freedom. Using data from 106 recipient countries between 1994 and 2010, they find that aid has a significant positive impact on press freedom only in democracies but not autocracies. According to Dutta and Williamson (2016), foreign aid fails to promote media freedom in authoritarian countries due to their lack of oversight, accountability, and transparency. By contrast, in democratic countries with balances and checks, foreign aid promotes media freedom through financial support and infrastructure.

While the pioneering study of Dutta and Williamson (2016) focuses on how recipient countries' political regimes moderate the effects of foreign aid on media freedom, they mainly focus on foreign aid donated by the OECD countries. One key characteristic of OECD foreign aid, also known as official development assistance (ODA), is its conditionality. In particular, Aid conditionality refers to the conditions under which the recipient countries need to implement political and economic reforms requested by donor countries (Watkins 2022). As the goal of conditionality is to promote the economic development and welfare of recipient countries, the donor would withdraw, suspend, or terminate the aid if the recipients fail to meet the conditionality requirements, Therefore, foreign aid with conditionality is more effective in

inducing structural reform in recipient countries than foreign aid without conditionality (Wright and Winters 2010) .

China as a New International Donor

China's economic growth since the 1980s has transformed itself from an aid recipient to a major international donor. Dreher et al. (2021a, p. 139) report that China had officially "committed, implemented, or completed" foreign development projects worth 354 billion USD between 2000 and 2014, whereas the U.S. provided 394 billion USD of official financing to foreign countries during the same period. As a result, scholars have paid special attention to the motivations and consequences of Chinese foreign aid (Bräutigam 2011; Dreher et al. 2021b; Strange et al. 2017). One key finding of this research agenda is that China, like other major Western donors, allocates its aid strategically to fulfill various political and economic goals (Dreher et al. 2018; Harchaoui, Maseland, and Watkinson 2021).

The emergence of China as a new donor also challenges the conventional wisdom on the effectiveness of foreign aid. As indicated in the previous section, OECD donors allocate aid in the form of ODA with conditionality to induce recipient countries to implement political and economic reforms. However, China follows the principle of non-interference in the domestic affairs of other countries and allocates its aid without conditionality. As a result, Chinese aid is sometimes labeled as "no strings attached" or "rogue aid" (Naim 2007). Recent studies have pointed out that the lack of conditionality of Chinese aid has led to some negative consequences in recipient countries. For example, Isaksson and Kotsadam (2018) report that African countries receiving Chinese aid have more local corruption. Ping, Wang, and Chang (2022) report that receiving Chinese aid reduces recipient countries' vertical accountability as their executives would be less constrained by other government branches. Watkins (2022) also finds that countries receiving more Chinese aid have lower compliance with the aid conditionality imposed by the World Bank because China offers an "outside option" with no conditionality

for these aid recipients. In this article, we follow these insights and investigate whether China's aid in the communication sector would enhance recipient countries' digital repression.

The Rise of China's Digital Authoritarianism

As the most predominant authoritarian country in the world, China relies on advanced information technology, such as online censorship and digital surveillance, to control information, monitor civil society, and consolidate its authoritarian rule (King, Pan, and Roberts 2013; Lorentzen 2014; Xu, Kostka, and Cao 2021). In short, China has been a successful case of "informational autocrats" (Guriev and Treisman 2019). Other authoritarian countries have a strong incentive to learn from China by importing China's digital statecraft to strengthen their authoritarian control (Polyakova and Meserole 2019). Meanwhile, China actively promotes its information technology to other countries for economic and political reasons. By exporting its digital technology to other countries, Chinese companies make profits that further help China to seek to upgrade its digital statecraft. China also increases its political affinity and influence over countries importing its information technology. As a result, the diffusion of China's digital authoritarianism facilitates the new wave of "autocratization" that erodes democratic development in the world (Taylor 2022).

China has exported its digital authoritarianism to other countries via its economic exchanges. Gamso (2021) reports that China has strengthened the media censorship of its trading partners. When a country trades more with China, its media censorship level increases because China would like this trading partner to reduce negative media coverage about China. Using 163 countries from 2002 to 2014, Gamso (2021) finds that media censorship has spread from China to its trading partners, particularly in democracies that trade intensively with China.

As Gamso (2021) focuses on the effects of trading with China on the media environment, we base on this insight and investigate whether receiving more aid from China would have a similar effect. We argue that Chinese aid is detrimental to the development of recipient

countries' media environment as they can learn from China's digital statecraft to suppress media freedom.

Chinese Communication Aid, Digital Repression, and Media Freedom

With the increasing popularity of information and communication technologies (ICT), the Internet has reshaped human life and the functioning of society. According to Internet World Stats, about 66.2% of the world's population is an Internet user, an increase of 1355% from 2000 to 2022. Part of the reason for this rapid growth in global Internet coverage is the impact of the Arab Spring and the Jasmine Revolution on authoritarian states. Shocked by both unexpected social movements, authoritarian elites recognized the role of communication technologies such as the Internet and social media in anti-government protests. Authoritarian regimes need to develop or introduce censorship technology to ensure regime stability and prevent protesters from mobilizing through communication technologies.

According to Kendall-Taylor, Frantz, and Wright (2020), China has become a global leader in digital repression due to its implementation of the so-called "Great Firewall," the world's largest censorship system. Within China's censorship system, the government monitors civil society and directs technology and telecommunications companies to work together to filter any content that the regime deems harmful. As a result, China's censorship technology has become a model for authoritarian countries to emulate.

Based on the discussions in this section, we argue that receiving Chinese aid will benefit ICT development in the recipient country. In addition, the recipient country may use Chinese funds to monitor, censor, or repress people's activities in the digital realm. Therefore, receiving Chinese aid would enhance digital repression and thus suppress media freedom in recipient countries. Based on these reasonings, we formulate the following two hypotheses:

H1: Countries receiving more communication aid from China have a higher level of digital repression.

H2: Countries receiving more communication aid from China have a lower level of media freedom.

Research Design

Data

To test our hypotheses, we utilize the latest version of the AidData project's Global Chinese Development Finance Dataset and construct a dataset of several important political and economic variables in addition to China's foreign aid and investment for 111 countries during the period from 2002 to 2017. Our observation ends in 2017 because it is the last year of observation of our key explanatory variable, *Chinese Communication Aid*, in the Global Chinese Development Finance Dataset constructed by AidData.

In particular, the AidData team has endeavored tremendous collective efforts to collect detailed data on China's international development projects, including 13,427 projects worth $843 billion across 165 countries after 2000 (Strange et al. 2017). We would like to note other authoritative data sources on Chinese aid, such as the one maintained by the SAIS China Africa Research Initiative (SAIS-CARI) based at Johns Hopkins University. Yet, the AidData provides the most comprehensive track on China's foreign development finance after 2000 (Dreher et al. 2022), including the communication sector. It allows us to disaggregate the effect of communication sector aid, so we opt to use it in our empirical analysis to evaluate China's foreign influences on the censorship of recipient countries via its development finance. Tables A.1 and A.2 in the Appendix list the countries and summary statistics of the variables in this paper, respectively.

Key Explanatory Variable

The key explanatory variable is based on the Global Chinese Development Finance Version 2.0 data set collected by the AidData project (Dreher et al. 2022). Since we focus on how Chinese foreign aid influences digital capacity and repression in recipient countries, we disaggregate the

total amount of Chinese foreign aid (in constant 2017 U.S. dollars) into communication-related projects and other projects. We aggregate all projects in the "communications" (3-digit CRS sector code: 220) category for the former to create the country-level variable, *Chinese Communication Aid.* For the latter, we aggregate projects of all other categories in the dataset. In this article, China's aid refers to the Chinese government's official finance to foreign countries, including aid and debt-financed projects collected in the AidDaata project. To better capture the aid flows into recipient countries, we take a three-year moving average for these measures of aid (Dietrich and Wright 2015). In addition, we log-transform *total Chinese aid*, *Chinese Communication Aid*, and *Chinese Aid (Other)* to address any skewing of these variables.

Dependent Variables

In this paper, we focus on the influence of Chinese communication aid on the recipient country's digital repression and media freedom. To capture the extent of digital repression in countries receiving Chinese aid, we follow Frantz et al.'s methodology that uses the data from the Digital Society Project (DSP) (Mechkova et al. 2022). The DSP is a component of the Democratic Diversity Project (Coppedge et al. 2022), which captures various dimensions of digital repression from 2000 to 2021. In addition, we use the data on media freedom collected by the V-Dem project as an alternative dependent variable. We describe the operationalization of these variables below.

Digital Repression. Following Frantz, Kendall-Taylor, and Wright (2020), we single out a set of variables that reflect the latent concept of state-led digital repression, including social media censoring, social media monitoring, social media shutdown, Internet shut own, Internet filtering, and social media alternatives. For this set of variables, we combined them into a single scale using Cronbach's alpha. This scaled index, which combines information on all six variables, has overall scale reliability of 0.966, indicating that, on average, the items are highly correlated with each other. For the extent to which each item is correlated with the scaled index, please refer to Table A.3 (b) in the Appendix.

Media Freedom. The second dependent variable in our empirical analysis is the recipient country's media freedom. We use the data on media freedom collected by the V-Dem project. In particular, this variable measures "to what extent does government respect press and media freedom, the freedom of ordinary people to discuss political matters at home and in the public sphere, as well as the freedom of academic and cultural expression."

Figures 1 and 2 illustrate the time trend of digital repression and media freedom for recipient countries receiving Chinese aid. We calculate the annual average time trend based on three country samples. The solid black line indicates all countries receiving Chinese aid, the solid gray line indicates countries receiving communication aid from China, and the dashed line indicates countries not receiving Chinese communication aid. Overall, Figures 1 and 2 have two messages. First, recipient countries' digital repression increases over time regardless of the category of Chinese aid. Second, the solid gray line based on the sample of countries receiving Chinese communication aid is higher than the dashed line for the sample of other countries receiving non-communication aid. This result implies that the influence of Chinese communication aid on recipient countries' digital repression and media freedom is greater than that of non-communication aid. Both graphs offer preliminary support for our hypotheses.

Figure 1. Time trend in digital repression, by Chinese aid projects

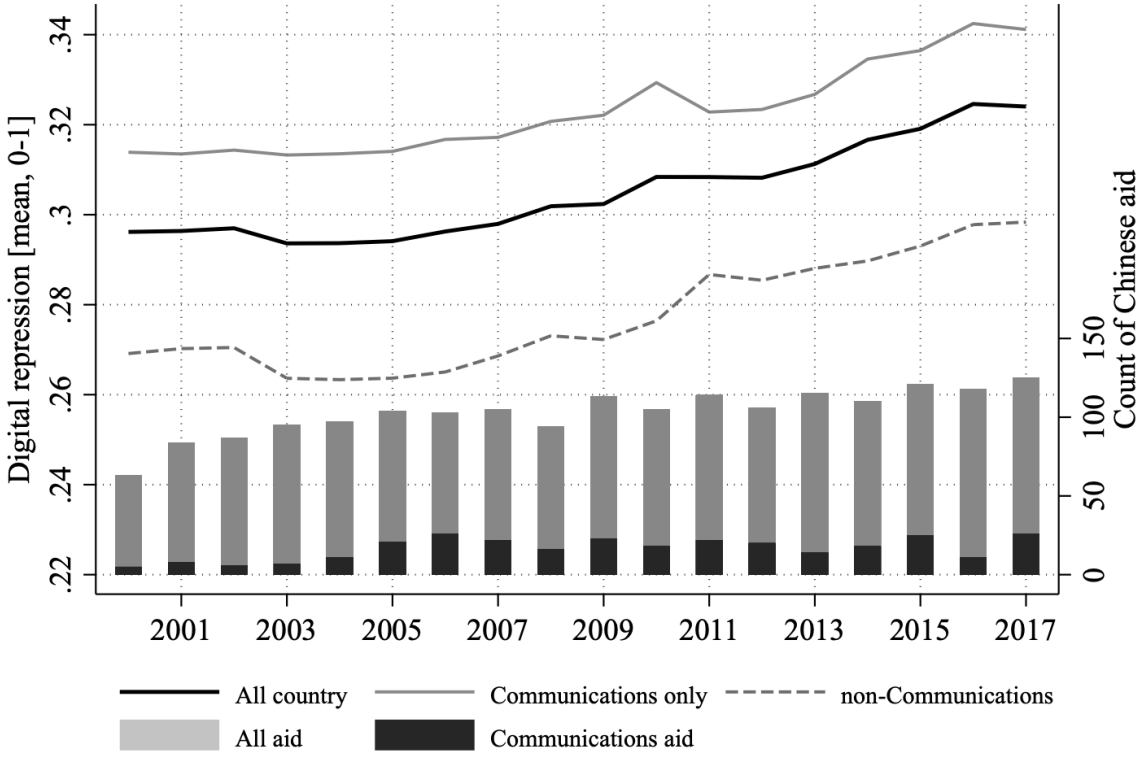
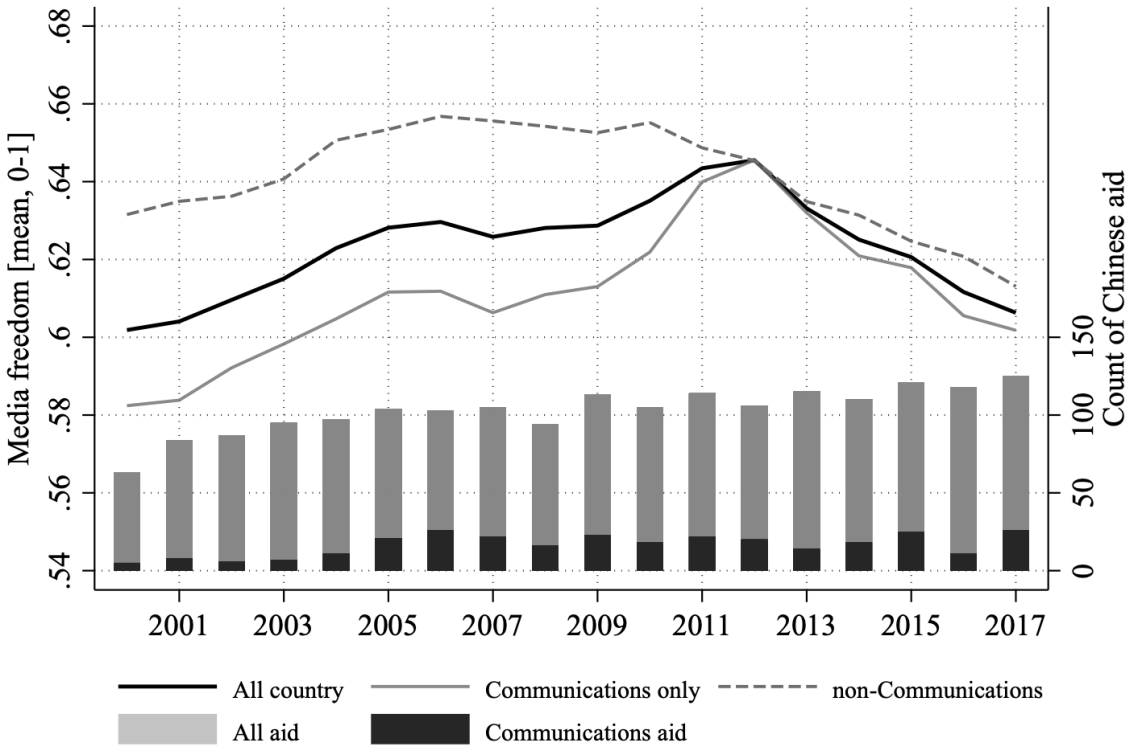


Figure 2. Time trend in media freedom, by Chinese aid projects



Control Variables

While our key independent variable is Chinese communication aid, we also include additional variables to control their influences on the dependent variables. First, we control other non-communication aid received from China. Second, we control for received aid allocated by the Development Assistance Committee (DAC) of the OECD members. Third, we include a country's GDP per capita, urban population (as a percentage of the total population), and coverage of mobile phones. Fourth, we control a country's oil rent per capita and trade openness. Fifth, we include a country's political stability and the level of democracy.

The data on DAC members' aid is taken from the Creditor Reporting System collected by the Organisation for Economic Co-operation and Development (OECD). GDP per capita, urban population, oil rent per capita, internet coverage, and net FDI are taken from the World Development Indicators collected by the World Bank. The data on political stability is taken from the Worldwide Governance Indicators (also developed by the World Bank). Data on export to China/non-China trade are taken from the International Monetary Fund (IMF). To address skewness, we log-transform the DAC members' aid, GDP per capita, and oil rent per capita, Including these additional variables as controls in our models would partial out their confounding effects on the dependent variables.

Estimation Results

To further evaluate the relationships between Chinese aid and media censorship of recipient countries, we estimate a series of ordinary least squares (OLS) with two-way fixed effects (TWFE) to account for unobserved heterogeneity at the unit and time levels. We cluster standard errors at country level to account for heteroscedasticity. We lag all independent variables for one year to avoid simultaneity between them and the dependent variables. We

report our model estimation results for digital capacity (Models 1 to 3) and digital repression (Models 4 to 6) in Table 1.

Model 1 in Table 1 only shows significant relationships for regime type and not total Chinese aid. Because total Chinese aid contains different categories, these categories do not necessarily all influence digital repression. Therefore, the insignificant results for total Chinese aid in Model 1 may result from the mixture of these different aid categories. We disaggregate total Chinese aid into communication-related aid and other non-communication-related aid. Model 2 shows that recipient countries receiving more Chinese communication aid have more digital repression, while countries that are more democratic or receiving aid from DAC members aid have lower digital repression. This result holds after we include control variables in Model 3. Results in Models 4 to 6 with recipient countries' level of media freedom as a dependent variable reconfirm those in Models 1 to 3: When a country receives more Chinese communication aid, it has lower media freedom. These findings support our hypotheses.

Table 1. Chinese aid, digital repression, and media freedom

	Digital Repression			D	Media Freedom (V-Dem)		
	Model 1	**Model 2**	**Model 3**		**Model 4**	**Model 5**	**Model 6**
Chinese Aid	0.004				-0.001		
	(0.003)				(0.001)		
Chinese Aid		0.005**	0.005**			-0.002**	-0.002**
(Communication)		(0.002)	(0.002)			(0.000)	(0.000)
Chinese Aid		0.003	0.004			0.000	0.000
(Other)		(0.003)	(0.003)			(0.001)	(0.001)
DAC Members Aid	-0.033	-0.034	-0.030		0.013	0.013	0.012
(WDI)	(0.028)	(0.027)	(0.031)		(0.009)	(0.009)	(0.010)
Regime Type	-0.037**	-0.036**	-0.035**		0.022**	0.021**	0.021**
(Polity2)	(0.015)	(0.014)	(0.016)		(0.004)	(0.004)	(0.004)
Political Stability			0.017				-0.011
			(0.063)				(0.019)
Mobile Phone Coverage			-0.000				0.000
(per 100)			(0.001)				(0.000)
GDP Per Capita (ln)			0.024				0.018
			(0.144)				(0.028)
Urban Population			0.005				-0.003
(% Total)			(0.008)				(0.002)
Oil Rent			0.001				-0.002
(% GDP)			(0.003)				(0.001)
Trade			-0.000				0.000
(% GDP)			(0.001)				(0.000)
Constant	0.851	0.884*	0.372		0.337*	0.326*	0.378
	(0.535)	(0.523)	(1.554)		(0.181)	(0.178)	(0.346)
Time FE	Yes	Yes	Yes		Yes	Yes	Yes
Country FE	Yes	Yes	Yes		Yes	Yes	Yes
Adj. R-sq (within)	0.168	0.186	0.189		0.302	0.316	0.322
Observations	1,775	1,775	1,511		1,775	1,775	1,511
Countries	118	118	112		118	118	112

Note: Robust standard errors clustered at the country level are reported in parentheses: * p<0.1; ** p<0.05; *** p<0.01.

Readers may be concerned about the endogeneity of our empirical analysis. To address this issue, we estimate two-stage least squares (2SLS) instrumental regression models. Previous studies used the interaction term between China's annual steel production and the probability of the recipient country receiving Chinese aid (Dreher et al. 2021b; Ping, Wang, and Chang 2022) as an instrumental variable for Chinese aid. The insight of using this interaction term as an instrument for Chinese aid is twofold. First, China provides more aid to other countries as it has more excess steel production. Second, the probability of a country receiving Chinese aid is also determined by other variables that are both specific to them and exogenous to the Chinese excess steel production. As Chinese communication aid accounts for a substaitial proportion of Chinese aid (see Figures 1 and 2), we follow this strategy and use the interaction term between China's annual steel production and the probability of receiving Chinese aid in recipient countries as an instrument. This interaction term is conditionally exogenous to the dependent variable and satisfies the exclusion restriction. The data for China's excess steel production are taken from the WDI, and we log-transform the data to address its skewness.

We report the results of 2SLS instrumental regression models in Table 2. The first-stage estimation of Model 7 shows that China's steel production positively correlates with the amount of its communication aid. The right-hand columns of Models 7 and 8 show that Chinese communication aid decreases with digital repression (Model 7) but decreases with media freedom (Model 8) in the 2nd-stage estimation. Note that the F-statistic for 1st-stage is 25.42, so our instrument is not weak. Therefore, the results in Table 2 reconfirm that Chinese communication aid has a causal effect on recipient countries' digital repression and media freedom.

Table 2. Addressing endogeneity

	Digital Repression		Media Freedom
	Model 7		Model 8
	1st Stage	2nd Stage	2nd Stage
Chinese Aid (Communication)		0.016***	-0.005***
		(0.006)	(0.002)
Chinese Aid (Other)	0.304***	0.002	0.001
	(0.069)	(0.003)	(0.001)
DAC Members Aid (WDI)	-0.279	-0.032**	0.011**
	(0.381)	(0.014)	(0.005)
Regime Type (Polity2)	-0.335***	-0.036***	0.021***
	(0.107)	(0.006)	(0.002)
Political Stability	-0.294	0.025	-0.013*
	(0.554)	(0.023)	(0.008)
Mobile Cellulare (per 100)	0.015	-0.000	0.000*
	(0.012)	(0.001)	(0.000)
GDP Per Capita (ln)	-0.224	0.021	0.016
	(1.036)	(0.050)	(0.015)
Urban Population (% Total)	0.156	0.005	-0.003*
	(0.121)	(0.004)	(0.001)
Oil Rent (% GDP)	0.205***	-0.001	-0.001
	(0.050)	(0.002)	(0.001)
Trade (% GDP)	0.008	-0.000	0.000***
	(0.012)	(0.000)	(0.000)
Production of Crude Steel (China)	15.354***		
	(2.230)		
Time FE	Yes		Yes
Country FE	Yes		Yes
Observations	1,448		1,448
Countries	112		112
First-Stage F	47.40***		47.40***

Note: The first-stage estimation of Model 8 is identical to that of Model 7. Robust standard errors clustered at the country level are reported in parentheses: * p<0.1; ** p<0.05; *** p<0.01.

Table 3. Robustness Checks

	Model 9	Model 10	Model 11	Model 12	Model 13
	AidData	Huawei	Trade	LDV	HAC
Chinese Aid	0.004*	0.007**	0.005**	0.001**	0.002**
(Communication)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Chinese Aid	0.002	0.009*	0.004	0.001	0.001
(Other)	(0.003)	(0.005)	(0.003)	(0.001)	(0.001)
DAC Members Aid		-0.034	-0.016	-0.003	-0.017*
(WDI)		(0.044)	(0.032)	(0.005)	(0.009)
DAC Members Aid	0.004				
(Communication)	(0.005)				
DAC Members Aid	-0.032**				
(Other)	(0.010)				
Regime Type	-0.021*	-0.050*	-0.036**	0.002	-0.015**
(Polity2)	(0.012)	(0.025)	(0.016)	(0.002)	(0.004)
Political Stability	0.055	0.003	-0.002	-0.002	0.012
	(0.052)	(0.090)	(0.060)	(0.009)	(0.017)
Mobile Cellulare	-0.000	-0.001	-0.001	0.000	-0.000
(per 100)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
GDP Per Capita (ln)	0.019	-0.095	0.053	-0.010	0.038
	(0.141)	(0.190)	(0.113)	(0.035)	(0.037)
Urban Population	0.006	0.007	0.006	0.002	0.006*
(% Total)	(0.008)	(0.010)	(0.007)	(0.002)	(0.003)
Oil Rent	-0.002	0.004	-0.003	0.001	0.000
(% GDP)	(0.002)	(0.003)	(0.005)	(0.001)	(0.001)
Trade	-0.000	-0.002		0.000	-0.000
(% GDP)	(0.001)	(0.002)		(0.000)	(0.000)
Exports to China (ln)			0.012		
			(0.022)		
Exports to not China (ln)			0.002		
			(0.043)		
Lagged DV				-0.093**	
				(0.025)	
Constant	0.423	1.235	-0.190	0.037	0.916**
	(1.067)	(2.186)	(1.460)	(0.322)	(0.456)
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Adj. R-sq (within)	0.115	0.244	0.193	0.069	
R-squared					0.895
Observations	1,157	881	1,613	1,511	1,511
Countries	108	59	116	112	112

Note: Robust standard errors clustered at the country level are reported in parentheses: * p<0.1; ** p<0.05; *** p<0.01.

Robustness Checks

We conduct additional models to check the robustness of empirical findings. First, based on the comprehensive dataset of bilateral aid constructed by the AidData project (Tierney et al. 2011) , we differentiate DAC aid into two types: communication and non-communication. The result show that the communication aid from DAC members has no significant effects on digital repression in recipient counties, whereas their non-communication aid mitigates digital repression. Second, we replace the variable of Chinese communication aid with a dummy variable indicating whether a recipient country received aid from Huawei, China's largest telecommunication company. The results show that countries receiving aid from Huawei have more digital repression. In addition, we estimate the role of trading with China on recipient countries' digital repression. We find that a country's export to China is not statistically correlated with its level of digital repression.

We also consider the dynamic structure of our data and estimate two additional models to address the issue of serial correlation. First, we include a lagged dependent variable in Model 12 and address the first-order autocorrelation in Model 13. Results in both models are consistent with those in previous models.

Does Regime Type Matter?

Since most definitions of democracy are based on the government allowing the opposition to organize freely, compete, and elect fairly in politics. On the other hand, the power of politicians in democracies is more restricted by their legal environment than that of leaders in authoritarian countries. Thus, the influence of Chinese communication aid on the digital capacity and repression of recipient countries may be conditional on the regime type of the recipient country. In Table 4, we control for the possible moderating effect of regime type on the relationship between Chinese communication aid and digital repression (Models 14 and 15) and media freedom (Models 16 and 17). *Regime Type* is measured using the Polity2 variable

from Marshall and Gurr (2020), which classifies regime type on a scale from -10 (highest degree of authoritarianism) to 10 (highest degree of democracy). We rescale the regime type to [0,1] so that 1 corresponds to the highest level of democracy (the original scale is 10). Similarly, we use the executive constraints as an alternative to regime type. Yet, the interactction terms between regime characteristics and Chinese communication aid is statistically insignificant in these models, suggesting that regime type does not moderate the effects of Chinese communication aid on recipient countries' media environment.

Table 4. Regime type, digital capacity and digital repression

	Digital Repression		Media Freedom (V-Dem)	
	Model 1	**Model 2**	**Model 4**	**Model 5**
Chinese Aid	0.005**	0.007*	-0.002**	-0.001
(Communication)	(0.002)	(0.004)	(0.001)	(0.001)
Chinese Aid	0.004	0.005	0.000	-0.000
(Other)	(0.003)	(0.003)	(0.001)	(0.001)
DAC Members Aid	-0.030	-0.022	0.012	0.006
(WDI)	(0.031)	(0.031)	(0.010)	(0.009)
Regime Type	-0.035**		0.021**	
(Polity2)	(0.016)		(0.004)	
Chinese Aid X Regime Type	-0.000		-0.000	
	(0.000)		(0.000)	
Executive Constraints		-0.071**		0.051**
		(0.036)		(0.010)
Chinese Aid X Executive Constraints		-0.000		-0.000
		(0.001)		(0.000)
Political Stability	0.017	-0.043	-0.011	0.019
	(0.063)	(0.062)	(0.019)	(0.014)
Mobile Cellulare	-0.000	-0.000	0.000	0.000
(per 100)	(0.001)	(0.001)	(0.000)	(0.000)
GDP Per Capita (ln)	0.024	0.012	0.018	0.028
	(0.144)	(0.148)	(0.028)	(0.031)
Urban Population	0.005	0.004	-0.003	-0.003
(% Total)	(0.008)	(0.007)	(0.002)	(0.002)
Oil Rent	0.001	0.000	-0.002	-0.001
(% GDP)	(0.003)	(0.003)	(0.001)	(0.001)
Trade	-0.000	-0.001	0.000	0.000
(% GDP)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	0.372	0.540	0.378	0.236
	(1.554)	(1.594)	(0.347)	(0.362)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. R-sq (within)	0.189	0.161	0.322	0.315
Observations	1,511	1,435	1,511	1,435
Countries	112	109	112	109

Note: Robust standard errors clustered at the country level are reported in parentheses: * p<0.1; ** p<0.05; *** p<0.01.

Discussions and Conclusions

After the Arab Spring and the Jasmine Revolution, the world witnesses the role of the Internet and social media in civil protests. This phenomenon has prompted countries worldwide, especially authoritarian regimes, to develop or introduce censorship technologies to ensure regime stability and national security. As a pioneer in digital repression, China's censorship technology has become a model for authoritarian states of all stripes to emulate. In this paper, we argue that Chinese aid, particularly communication aid, increases the digital capacity of recipient countries but also strengthens their level of digital repression. Specifically, recipient countries have developed censorship techniques to prevent protesters from mobilizing through the Internet and social media, with technical support from Chinese communication aid projects. To test our argument, we empirically investigate the influence of Chinese communication aid on digital capacity and repression using internationally renowned datasets, including the World Development Indicators, Global Governance Indicators, AidData, and the V-Dem Project. We conduct two-way fixed-effects regression models to analyze data from 111 developing and underdeveloped countries that received Chinese aid between 2002 and 2017. We find that receiving more Chinese communication aid increases recipient countries' digital capacity and strengthens their levels of digital repression. These findings are robust to alternative model specifications that address the issue of reversed causality, suggesting that Chinese communication aid has a causal effect on increasing digital capacity and digital repression in recipient countries.

Although our findings shed light on the emerging literature on Chinese aid, they also have some limitations. First, we cannot analyze a more extended period because the AidData project on China's overseas development finance covers the post-2000 period. Second, we are unable to analyze the specific actions of the recipient country's executive agencies and the reaction of the recipient country's civil society to these actions, which may have been a factor in how the regime leaders interacted with China. Future studies may investigate these issues.

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Appendix

Table A.1 lists the sample of 111 countries analyzed in Table 1 in the main text. The sample period ranges from 2002 to 2017.

Table A.1. Sample of countries

Afghanistan	Ecuador	Liberia	Serbia
Albania	Egypt	Libya	Sierra Leone
Algeria	El Salvador	Madagascar	South Africa
Angola	Equatorial Guinea	Malawi	South Sudan
Argentina	Eritrea	Malaysia	Sri Lanka
Armenia	Ethiopia	Mali	Sudan
Azerbaijan	Fiji	Mauritania	Suriname
Bangladesh	Gabon	Mauritius	Syria
Belarus	Georgia	Mexico	Tajikistan
Benin	Ghana	Moldova	Tanzania
Bolivia	Guinea	Mongolia	Thailand
Botswana	Guinea-Bissau	Montenegro	The Gambia
Brazil	Guyana	Morocco	Timor-Leste
Burma/Myanmar	Haiti	Mozambique	Togo
Burundi	Honduras	Namibia	Trinidad and Tobago
Cambodia	India	Nepal	Tunisia
Cameroon	Indonesia	Nicaragua	Turkey
Cape Verde	Iran	Niger	Turkmenistan
Central African Republic	Iraq	Nigeria	Uganda
Chad	Ivory Coast	Oman	Ukraine
Chile	Jamaica	Pakistan	Uruguay
Colombia	Jordan	Panama	Uzbekistan
Comoros	Kazakhstan	Papua New Guinea	Venezuela
Congo, DR	Kenya	Paraguay	Vietnam
Congo, Rep	Kyrgyzstan	Peru	Yemen
Costa Rica	Laos	Philippines	Zambia
Djibouti	Lebanon	Rwanda	Zimbabwe
Dominican Republic	Lesotho	Senegal	

Table A.2. Summary statistics

Variable	N	Mean	Std. Dev.	Min	Max
Digital Capacity	1570	-0.07	0.71	-1.86	1.66
Digital Repression	1570	0.19	0.81	-1.02	2.52
Media Bias	1452	0.59	0.18	0.00	0.91
Media Freedom	1452	0.31	0.33	0.00	1.00
Media Integrity	1452	0.58	0.18	0.00	0.88
Media Self-Censorship	1452	0.57	0.18	0.01	0.92
Chinese Aid (Communication)	1570	5.84	7.98	0.00	20.72
Chinese Aid (Other)	1570	17.49	4.03	0.00	23.86
DAC Members Aid	1570	20.11	1.33	15.40	23.26
Regime Type (Polity2)	1570	0.64	0.28	0.05	1.00
Political Stability	1570	-0.57	0.83	-2.94	1.22
Internet Coverage (% Total)	1570	17.90	19.52	0.00	83.56
GDP Per Capita (ln)	1570	7.51	1.14	4.72	10.04
Urban Population (% of total population)	1570	48.16	20.59	8.25	95.24
Oil Rent Per Capita (ln)	1570	4.84	4.62	0.00	13.84
Exports to China (ln)	1570	6.39	2.12	0.18	11.19
Exports to not China (ln)	1570	8.63	1.70	4.09	12.97
FDI (Net Inflows, % GDP)	1570	4.30	6.51	-37.15	103.34

Table A.3. Item-test correlations for each item digital repression

Items	Item-test Correlation	α
Government social media censorship in practice	0.941	0.957
Government social media monitoring	0.893	0.964
Government social media shut down in practice	0.949	0.956
Government Internet shut down in practice	0.927	0.959
Government Internet filtering in practice	0.942	0.957
Government social media alternatives	0.897	0.964

Table A.4. Robustness Checks

	Digital Repression					
	Measurement Units			Moving-Average		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
	[Ln, pr]	[% GDP]	[% GNI]	[no-Avg]	[Avg 2y]	[Avg 4y]
Chinese Aid	0.033**	7.919**	7.832**	0.005**	0.005**	0.006***
(Communication)	(0.016)	(3.569)	(3.422)	(0.002)	(0.002)	(0.002)
Chinese Aid	0.026***	0.549	0.562	0.002**	0.003	0.004
(Other)	(0.010)	(0.376)	(0.374)	(0.001)	(0.002)	(0.004)
DAC Aid	-0.038	-0.434	-0.418	-0.024	-0.025	-0.038
(WDI)	(0.033)	(0.505)	(0.496)	(0.022)	(0.026)	(0.034)
Constant	-0.053	-0.253	-0.259	0.296	0.321	0.473
	(1.191)	(1.186)	(1.187)	(1.441)	(1.505)	(1.605)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq (within)	0.186	0.164	0.164	0.172	0.178	0.194
Observations	1,517	1,535	1,535	1,428	1,490	1,527
Countries	112	112	112	111	112	112

Note: Country-year from 2002-2017; Robust standard errors clustered at the country level are reported in parentheses: * p<0.1; ** p<0.05; *** p<0.01.