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Connect First, then Suppress: Chinese vs. Western Communication Development Projects and Internet Freedom

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Abstract
Over recent decades, developing countries have witnessed a rapid surge in internet connectivity, driven by an upswing in aid projects dedicated to information and communication technology (ICT) development. While many expect the increased internet connectivity to contribute to the freedom of expression and freer flow of information, others worry that it would rather enable recipient governments to expand their information control and digital surveillance. How do communication aid projects affect internet freedom in recipient countries? Through a cross-national analysis of aid and internet freedom in developing countries, our research reveals that the effect of communication aid on internet freedom varies by the sources of aid projects. Specifically, Chinese aid geared toward communication development has a negative relationship with internet freedom in recipient countries. Conversely, communication aid projects funded by the World Bank and the United States do not exhibit a similarly negative correlation. This paper also finds that the negative association between Chinese communication aid projects and internet freedom is more pronounced in autocratic recipient countries.

Keywords Foreign aid · China · World bank · Information and Communication Technology (ICT) · Internet freedom · Social media

Introduction

High-speed internet and access to information has become a necessity for various aspects of human life, including communication, education, health care, and beyond. In developing countries, the development of information and communication technology (ICT) and the expansion of the internet are also expected to substantially improve social and economic conditions (Ho, Narins, and Sung 2023; Vu, Hanafizadeh, and Bohlin 2020). Unfortunately, universal and reliable internet connectivity is still a luxury in developing countries. Many lack the budgetary and manufacturing

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capabilities to build and manage ICT infrastructure on their own or to import costly ICT goods as extensively as they need (Arnold 2023). In this regard, technological and financial support from international donors is crucial for expanded access to the internet in developing countries.

This connectivity gap is slowly but steadily narrowing as international donors and aid programs recognize the critical role of enhanced internet connectivity in fostering social and economic progress in developing countries. With the increasing number of aid projects directed toward ICT development projects, many developing countries have witnessed substantial upticks in their internet access rate.[1]

However, whether these aid projects—designed to expand internet coverage and enhance ICT technology—promote freedom of expression and facilitate communication free from government surveillance and control remains inconclusive. In particular, there is growing concern that communication aid projects funded by authoritarian non-DAC (Development Assistant Committee) members, such as China, may inadvertently propagate authoritarian digital governance styles, utilizing ICT as a repressive tool for censorship and surveillance (Andrzejewski et al. 2023; Carter and Carter 2022; Gunitsky 2015).

How do communication aid projects affect the extent to which the recipient government controls, manages, and limits the freedom of expression on the internet? Does communication aid from China erode internet freedom? If so, is this phenomenon exclusive to projects funded by a non-DAC member like China, or is it also apparent in initiatives and aid programs funded by traditional DAC members and multilateral donor organizations?

In this paper, we empirically investigate these questions by contrasting the impact of communication aid financed by China, the United States, and the World Bank, on internet freedom within recipient countries in developing regions. To start off, we observe that China allocates significantly greater funds to communication aid projects compared to both the United States and the World Bank, particularly focusing on ICT projects rather than traditional media-related endeavors. Subsequently, utilizing cross-sectional data spanning from 2000 to 2017, we identify a substantial and negative correlation between Chinese communication aid and internet freedom in recipient countries. Conversely, projects funded by the World Bank and the United States do not exhibit such a negative association. Finally, our analysis reveals that the adverse connection between Chinese communication aid and internet freedom is particularly pronounced in recipient countries governed by authoritarian regimes.

This study makes three contributions. First, we center our examination on communication aid projects to assess their impact on internet freedom in recipient countries. Limited research has been conducted to disentangle the effects of communication aid projects from those of other aid initiatives.[2] We find that Chinese communication aid has a negative relationship with internet freedom in recipient

[1] Jacob Poushter. 2016. The PEW Research Center. Available at https://www.pewresearch.org/global/2016/02/22/internet-access-growing-worldwide-but-remains-higher-in-advanced-economies/

[2] There are several notable exceptions. Wang et al. (2020), for example, analyze Chinese aid for ICT projects in Africa. Carter and Carter (2022) investigate the impact of Huawei's technological transfers on internet freedom in African countries. However, the scope of Huawei's transfers only represents a fraction of communication aid projects directed to recipient countries.

countries. However, our findings do not indicate a comparable significant decrease in internet freedom among countries receiving substantial Chinese aid in other sectors. Second, while existing studies predominantly focus on African countries (e.g., Blair & Roessler 2021; Dreher et al. 2018; Gehring et al. 2022), our research expands beyond this region to examine the dynamics in countries outside Africa. This broader scope enhances our understanding of the political and social ramifications of communication aid funded by different types of donors. Third, by analyzing how the scope and effect of communication aid projects differ by funding sources, our study offers valuable insights for policymakers and aid donors from traditional donor countries and multilateral donor organizations. While our research indicates that aid from traditional donors generally does not erode internet freedom in recipient countries, it also reveals that such aid does not significantly enhance online freedom. More importantly, even if it did promote online freedom, the insufficient scale of communication development projects (in particular, the projects concerning ICT development) funded by traditional donors is unlikely to counterbalance any negative influence of Chinese communication aid effectively. Our findings underscore the need for developed countries to prioritize funding for ICT development projects while concurrently establishing robust guidelines and standards to safeguard freedom of expression online. This recommendation is all the more important as the U.S. cuts it foreign aid budget and the future of a variety of projects, including those focused on communication and ICT, is in doubt.

Aid and Internet Freedom

Over the past few decades, international donors—including OECD-DAC donor states (e.g., the United States), multilateral organizations (e.g., the World Bank and the United Nations Development Program), and non-DAC donors (e.g., China)—have acknowledged the importance of universal internet access in developing countries and have strived to improve internet accessibility in the developing world. For instance, the UN Sustainable Development Goals have prioritized achieving universal internet access by 2020 as a strategic initiative, aiming to bolster internet connectivity in developing countries. Beginning in 2015, China launched the Digital Silk Road (DSR) initiative to build Information and Communication Technology (ICT) infrastructure and improve internet connectivity in developing regions. With the increasing number of aid projects directed toward ICT development projects, many developing countries have witnessed substantial upticks in internet access rates.[3]

The effort by international donors to invest in the development of communication technology and improve internet connectivity may have benefited citizens in recipient countries by expanding political, social, and economic freedom (Diamond

[3] Jacob Poushter. 2016. The PEW Research Center. Available at https://www.pewresearch.org/global/2016/02/22/internet-access-growing-worldwide-but-remains-higher-in-advanced-economies/

and Plattner 2012), and enabling individuals to gain access to information (Farrell 2016). However, others worry that such increased internet connectivity and the development of communication technology may subject individuals to more strict censorship, surveillance, and information manipulation. Particularly, the evolution of ICT is viewed as a catalyst for bolstering authoritarian regimes' repressive capabilities. Censorship (Roberts 2018), surveillance (Chin and Lin 2022), information control (Haggard and Kaufman 2021; Morozov 2011; Tucker et al. 2017), and targeted repression (Gohdes 2020; Xu 2020) often follow along with these new technologies. According to the 2022 Freedom House report, for example, developing countries that rely heavily on foreign aid for ICT infrastructure development, such as Myanmar, Sudan, and Libya, are the countries that experienced the sharpest decline in their internet freedom.[4]

The concern regarding the potential negative impact of internet expansion is particularly pronounced when the technology and equipment are supplied by China. The discussion about the differing impacts of aid by donors is not entirely new. Many have questioned whether Chinese aid brings about detrimental social changes to recipient countries that aid from traditional donors does not. This conjecture stems from the fact that, unlike aid projects from developed countries, Chinese aid projects lack conditionalities aimed at fostering political reform or good governance, opting instead for non-interference policies. Studies find that Chinese aid is detrimental to horizontal accountability (Ping, Wang, and Chang 2022), deteriorates labor rights (Isaksson and Kotsadam 2018b), fosters repression (Kishi and Raleigh 2017), and exacerbates corruption issues (Isaksson and Kotsadam 2018a).

In contrast, some research indicates that aid projects funded by traditional DAC members or international donor organizations bring positive changes to aid recipient countries.[5] For example, World Bank aid projects improve citizens' expressed willingness to abide by key formal institutions (Isaksson and Durevall 2023), lower local corruption (Brazys, Elkink, and Kelly 2017), and center governance quality in the projects' key development policies and conditionality (Hernandez 2017; Hout 2007).

In assessing the effect of aid, most existing studies evaluate the overall impact of aid in aggregate without considering the specific characteristics and purposes of different aid programs (e.g., Blair & Roessler 2021; Dreher et al. 2022). In practice, development assistance comes in various forms and serves different objectives, ranging from natural resource development, medical aid, military aid, and

[4] Freedom House. 2022. Available at https://freedomhouse.org/article/new-report-repressive-governments-are-fracturing-internet-driving-12th-consecutive-year

[5] Note that the effect of foreign aid in recipient countries has long been a subject of debate. Some studies find no clear evidence that traditional (Western) donors contribute positively to economic growth or policy environment in recipient countries (Easterly 2003). Others even suggest that aid from traditional donors can have adverse effects on state-building and political accountability (Moss et al. 2006). In a recent review of the literature, Dreher, Lang, and Reinsburg (2024) find that aid is modestly effective at promoting development, but that it does a far better job of helping donors achieve various non-development goals such as market access and political influence.

technological development in communication. The impact and ramifications of aid may vary depending on its type and purposes. For instance, aid programs aimed at improving communication infrastructure may have a more direct influence on internet freedom in recipient countries compared to programs focused on military or medical assistance.

The lack of effort to disentangle the effects of aid projects in the communication sector leaves many questions unanswered: Do communication aid projects in general, regardless of the donor, explain the erosion of internet freedom in developing countries? Do communication aid projects from traditional donors have a different impact on internet freedom than those funded by China? Do recipient countries experience an erosion in internet freedom even when they receive aid in sectors unrelated to communication as long as the aid comes from China? Our goal is to address these gaps by analyzing aid projects sponsored by their different donors.

Making Inroads Through Communication Aid

Since the late 2000 s, China has placed significant emphasis on assisting developing countries in adopting various information and communication technologies (ICT). These efforts include expanding internet access, establishing safe urban environments, and enhancing city operations through the integration of ICT, such as facial recognition and traffic monitoring systems. Critics argue that China's assistance in building ICT infrastructure helps the Chinese government collect data on individuals and governments in recipient countries more efficiently (Bradford 2023). They also express concern that the Chinese government has an incentive to intentionally erode internet freedom in these countries to facilitate data collection and to export China's model of digital authoritarianism. Despite the conjectures, however, no sufficient evidence concludes that China collects and uses data it collects from recipient countries to bolster its position.[6]

In contrast to existing literature or conjectures that attribute the erosion of internet freedom solely to the Chinese government's global ambitions, we remain neutral on whether the Chinese government intentionally seeks to undermine internet freedom or export digital authoritarianism. Instead, we propose alternative mechanisms to explain the observed negative relationship between Chinese communication aid and internet freedom. Specifically, we emphasize the spillover effect of surveillance and monitoring technologies developed by Chinese tech firms and their misuse by recipient governments. Most communication aid projects funded by the Chinese government are implemented by domestic tech firms with a comparative advantage in surveillance and monitoring technologies. These firms may, intentionally or inadvertently, transfer their practices and technologies to recipient countries. Recipient governments, particularly those interested in controlling information and censoring

[6] See, for example, Steven Feldstein, 2020. "Testimony before the US China economic and security review commission". pp.1-20. Available at https://www.efaidnbmnnnibpcajpcglclefindmkaj/https://www.uscc.gov/sites/default/files/Feldstein_Testimony.pdf (Last Accessed May 15, 2024).

dissent to ensure their survival, can readily exploit these technologies for manipulation and repression.

Chinese tech companies have long been incentivized to develop advanced surveillance and monitoring technologies (Huang and Tsai 2022). In 1998, the Ministry of Public Security in China launched a digital surveillance system labeled the "Golden Shield Project." Under this banner, the Chinese government has prompted domestic tech companies to develop ID tracking systems, internet surveillance tools, and big data processing systems. Social media platforms have frequently been censored and subjected to government shutdowns as well (Gallagher and Miller 2021; King, Pan, and Roberts 2013). The Chinese government has further spurred technological development by providing Chinese tech firms with generous subsidies for developing such surveillance and censorship technologies and equipment (Beraja et al. 2023).

As Chinese domestic tech companies align with the government's objectives to develop these technologies, they have emerged as globally competitive players and have even assumed leadership roles in technology-intensive industries such as telecommunications and internet services. According to the World Bank open data, China's ICT service export value was ranked 4th in 2022, after Ireland, India, and the United States. According to a study about China's export strength, China exports Artificial Intelligence (AI)-based surveillance technologies more extensively than other countries. China's export strength in the AI industry is worth noting in that China does not exhibit such export dominance in any other frontier technologies, including power-generating machinery, electrical circuits, and chemical engineering (Beraja et al. 2023).

The role of Chinese tech companies becomes even more pronounced in the realm of Chinese communication aid, as the Chinese government guarantees that development projects it funds, such as the Digital Silk Road initiative, are exclusively executed by Chinese tech companies. This approach sharply contrasts with the practices of traditional DAC donors, which typically discourage the involvement of donor countries' own domestic firms in aid projects (Arnold 2023). The Chinese government has actively deployed communication aid projects to help domestic tech companies expand their markets and mitigate financial challenges from sanctions.[7] Notably, many Chinese firms involved in communication aid projects have been banned by developed countries for breaching privacy laws and creating serious cyber security concerns. For instance, the expansion into Central Asian and African markets has served as a crucial lifeline for Huawei amidst US sanctions. Similarly, Hikvision, another Chinese firm facing US sanctions, has been supplying facial recognition cameras and related equipment to Kazakhstan.[8]

[7] Council on Foreign Relations. "Assessing China's Digital Silk Road Initiative." Available at https://www.cfr.org/china-digital-silk-road/

[8] Altynbayev (2019). Chinese hardware in Kazakh cities raises spying concerns. Available at https://central.asia-news.com/en_GB/articles/cnmi_ca/features/2019/12/11/feature-01.

When these firms undertake aid projects, they not only bring skills and technologies to recipient countries but also the regulations and practices surrounding the operation of such technologies that they developed in their home countries. For example, a study about ICT development and corruption level shows that ICT development fails to reduce corruption in countries where a larger share of internet infrastructure is owned by foreign investors from autocracies (Freyburg, Garbe, and Wavre 2023). This tendency does not necessarily stem from an intentional effort by these foreign investors to increase corruption in the host countries. Instead, it is because foreign companies from authoritarian home countries are accustomed to operating under lower regulatory pressure and a more corruptive environment than investors coming from democratic contexts. Similarly, having operated in a regulatory environment that allows the government to exert greater control over online spaces, Chinese tech companies involved in communication aid projects may transmit these methods and practices to recipient countries.

The case of Meiya Pico, a Chinese firm specializing in mobile communication and digital security technology, illustrates how business practices and technologies developed under low regulatory pressure in China can spill over to other countries. Since 2013, Meiya Pico has been a key participant in Belt and Road Initiative foreign aid projects, providing services and technologies to developing countries such as Vietnam, Sri Lanka, and Egypt. The company has not only sold digital forensic technologies and mobile hacking equipment but also actively deployed professional and technical personnel to these countries to facilitate technical exchanges in digital forensics and cybersecurity. Meiya Pico's information security team has trained more than 1,000 overseas law enforcement officials in digital forensics (Weber 2019). The company also claims to have conducted over 50 training courses for police forces in nearly 30 recipient countries participating in the Belt and Road Initiative (Cave et al. 2019).

These exchanges and aid projects have significantly influenced legal regulations and practices governing cyberspace and internet freedom in recipient countries, aligning them more closely with China's restrictive internet and social media environment (Weber 2019). In Egypt, for example, where many officials received training from Meiya Pico, a cybercrime law was passed in 2018 to regulate social media and block websites that threaten national security, mirroring China's approach to controlling social media platforms and the Internet. Similarly, in Thailand, officials trained by Meiya Pico in mobile and computer forensics contributed to the passage of a law resembling China's 2017 cybersecurity law, which permits invasive government inspections of companies and individuals' property. These examples highlight how the export of a company's technologies and practices—shaped in a regulatory environment that limits internet and social media freedoms—can influence recipient countries by embedding similar restrictive policies and may even prompt the recipient government to adopt policies and legal frameworks that further curtails internet and social media freedom. Taken together, we expect that communication aid from China has a detrimental relationship with internet freedom in recipient countries (*Hypothesis 1a*).

Some might wonder if it is not just Chinese communication aid, but Chinese aid in general, that explains erosion in internet freedom. The extent to which a country's

leader controls society and influences the everyday lives of citizens, both online and offline, can grow as the leader secures more funding that lacks political conditionality. In this case, we would observe a negative relationship between Chinese aid and internet freedom not just in communication aid projects but aid projects across all sectors. This means that countries receiving larger amounts of Chinese aid in any sector would experience a sharper decline in internet freedom. However, we hypothesize that the adverse relationship between Chinese aid and internet freedom is unique to communication aid projects and that the size of Chinese aid projects in other sectors does not have any relationship with internet freedom (*Hypothesis 1b*). While Chinese firms and actors involved in projects outside the communications sector—such as energy, resource, or military assistance programs—may undermine internet freedom indirectly, they may not effectively pass the technologies and practices that directly compromise internet freedom to recipient countries.

Moreover, we expect that communication aid projects from traditional donors, such as the United States or the World Bank, are not negatively related to internet freedom in recipient countries (*Hypothesis 2*). We acknowledge that Chinese companies do not hold a monopoly on exporting technology that enhances the government's capacity to collect private information, monitor dissent's activities, and censor information. In fact, companies from developed democracies, such as the US, Italy, and Germany, frequently export these technologies to authoritarian regimes.[9] Nonetheless, it is pertinent to acknowledge that most developing countries lack the internal resources to finance and import costly ICT infrastructure and AI technologies from developed countries and instead rely on aid projects (Arnold 2023). Unlike trade, which primarily revolves around economic incentives, aid projects from traditional donors often aim to promote good governance, enhance human rights, and preserve freedoms in recipient countries. Consequently, technologies and infrastructure designed to reinforce governmental power at the expense of citizens are less likely to permeate developing countries when transferred through grants or development projects funded by Western donors. More importantly, tech companies that implement aid projects funded by traditional donors may lack familiarity with regulatory environments that allow for violations of human rights and freedom on the internet. They may even introduce best practices, guidelines, and procedures developed to preserve internet freedom and privacy, drawing from their experiences in their home countries.

Recipient Contexts Matter

The extent to which Chinese communication aid is negatively associated with internet freedom, however, is expected to vary by recipient countries. Beijing's stringent internet governance policies and technologies facilitating ICT-based repression can be more appealing to numerous authoritarian leaders than to democratic leaders. For

[9] Steven Feldstein, 2020. "Testimony before the US China economic and security review commission". pp.1-20. Available at https://www.efaidnbmnnnibpcajpcglclefindmkaj/https://www.uscc.gov/sites/default/files/Feldstein_Testimony.pdf.

instance, more than 70% of Huawei's "Smart City" agreements are signed by countries classified by the Freedom House as "partly free" or "not free."[10] In Nigeria—a country classified by the Freedom house as "partly free"—the Minister of Information, Culture, and Tourism has cited China's regulation of social media and the internet as a potential model for Nigeria to emulate.[11] Empirical studies also find evidence to support the claim that autocratic recipient countries are more likely to need technologies that may undermine internet freedom. A study of Chinese export dominance, for example, finds that autocracies and weak democracies are more likely to import surveillance technologies from China than mature democracies. The study also shows that non-democracies are even more likely to import Chinese AI-based surveillance technologies in times of domestic unrest and instability (Beraja et al. 2023).

In contrast, in democratic recipient countries, technologies and practices that potentially erode internet freedom are likely to face a higher level of scrutiny from civil society and appropriate regulation from domestic stakeholders. As a result, the potential negative impact of Chinese communication aid, or its exploitation to infringe upon online freedoms, is likely to be mitigated in democratic recipient countries.

Taken together, the extent to which Chinese communication aid undermines internet freedom in recipient countries may vary significantly depending on the institutional characteristics of the recipients. An analysis of the impact of Huawei's technological transfer in Africa provides important evidence that Huawei's technological transfer undermines digital freedom in the region but that the negative consequences on digital freedom are particularly pronounced in authoritarian recipient countries (Carter and Carter 2022). We argue that the institutional features of the recipients matter more broadly for overall communication aid projects and extend beyond recipient countries in Africa. According to this perspective, we should expect that the adverse relationship between Chinese communication aid and internet freedom is more pronounced in recipient countries with authoritarian governments (*Hypothesis 3*).

Trends in Communication Aid from China, the United States, and the World Bank

Before we assess the effect of communication aid on digital freedom in developing countries, we first describe how China's approach to communication aid differs from other important donors in the West—the United States and the World Bank. These two donors are often the first point of reference for Chinese aid, especially concerning geopolitical competition (Zeitz 2021). The World Bank's policies often align with the preferences of the United States, among many other influential Western

[10] Jonathan Hillman and Maesea McCalpin. 2019. "Watching Huawei's 'Safe Cities'." Available at https://www.csis.org/analysis/watching-huaweis-safe-cities

[11] Eric Olander. 2020. "Inspired by China's Example, Nigeria's Information Minister Wants to Regulate Social Media." China Global South Project. Available at https://chinaglobalsouth.com/2020/10/28/inspired-by-chinas-example-nigerias-information-minister-wants-to-regulate-social-media/

donors (Clark and Dolan 2021). However, trends in the allocation of communication aid by these donors have received limited attention. Therefore, before we examine whether this aid, and who it is from, negatively affects online freedom, we need to establish a few stylized facts about it.

In this section, we probe data collected on sector-level Official Development Assistance (ODA) disbursements (aid) from China, the United States, and the World Bank from 2000 to 2017.[12] Chinese data come from AidData at the College of William and Mary and data for the United States and the World Bank come from the OECD's Creditor Reporting System (CRS).[13]

Figure 1 shows total communication aid disbursements in 2017 constant USD from each of the donors of interest over time.[14] The left panel shows the percentage of communication ODA disbursements a donor is responsible for, and the right panel shows total values in billions of dollars. From the data, it is clear China outpaces both the United States and the World Bank in terms of its spending, and dramatically so. In the early 2000 s, China and the World Bank were nearly at parity in terms of relative contributions. Thereafter the pattern shifts substantially in China's favor. From the late 2000 s to 2015, China was responsible for nearly 100% of communication aid disbursed by these three donors. Its spending declined in 2016 and 2017 but in relative terms still exceeded spending by the World Bank and the United States. In terms of total amounts, while the World Bank and the United States spend in the range of hundreds of thousands to millions of dollars, China spends billions.

In recent years not captured by our data, the G7—an intergovernmental organization made up of the world's seven largest advanced economies (the US, UK, Canada, France, Germany, Italy, and Japan)—has recognized that it was lagging behind the Belt and Road Initiative in providing infrastructure projects to developing countries and slowly coordinated to catch up. The US coordinating with other G7 countries, launched a program known as the Partnership for Global Infrastructure and Investment (PGI) in 2021, as a competitor to China's BRI in 2023, to provide "better" infrastructure, ICT included, to "narrow the infrastructure gaps to enable inclusive and sustainable growth."[15] However, up to now, it is still at the fund-raising and planning stage so we are far from clear about the details—how the projects will be allocated and implemented to win the head-to-head competitions with the

[12] Studies differentiate aid commitments (the dollar amount donors agree to give in a year) and aid disbursements (the actual dollar amount that donors give in a year). The general consensus is that commitments are ideal for studying donor policy because they are an up-to-date reflection of donor preferences, whereas disbursements tend to lag (possibly years) behind commitments. Conversely, disbursements are ideal for studying aid's impacts on recipients because these are a better reflection of conditions on the ground. In our study, we use disbursements data since we are interested in the impact of aid on internet freedom in aid recipients.

[13] Accessible at https://stats.oecd.org

[14] To support comparisons over time, we adjusted disbursement values, which are in current or nominal prices, to 2017 constant USD (US Dollars). The adjustment was made using the {priceR} R package. Note as well that several of the Chinese communication aid projects name Huawei as the implementing agency.

[15] Lipin, Michael (2023). "US Boosts Funds for Infrastructure Program for Developing Nations Above $30 Billion." Voice of America, October 17. Available at https://www.voanews.com/a/us-boosts-funds-for-infrcastructure-program-for-developing-nations-above-30-billion/7314946.html

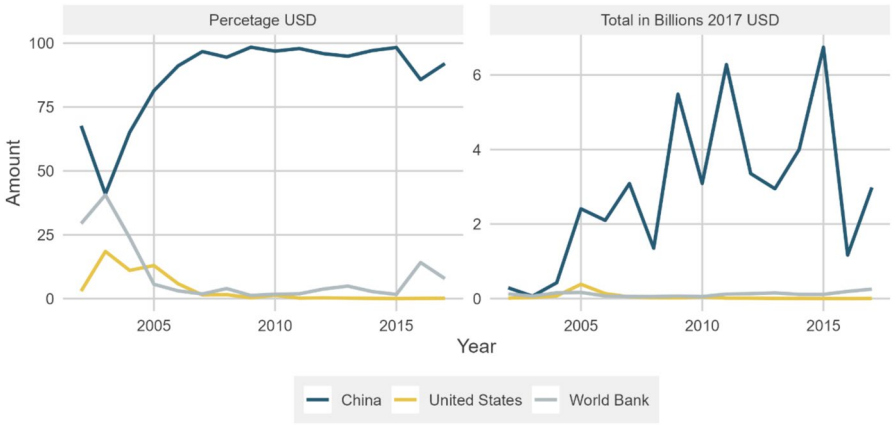

Fig. 1 ODA disbursements on communication projects by donors, 2000–2017

ICT-related BRI projects. In August 2022, the Biden administration launched the International Technology Security Innovation (ITSI) Fund, which will make billions of dollars available to support research and development of trustworthy telecommunications networks and secure semiconductor supply chains.[16] This initiative is meant to send the message that G7 nations, particularly the United States, are recognizing the urgency of catching up in delivering state-of-the-art technologies, encompassing cybersecurity, smart city solutions, and digital infrastructure, to emerging economies. These are domains where Beijing has made substantial investments and garnered expertise over the past decade. Documenting how these new trends shake out will be an important issue to consider in future research.

Beyond trends in communication aid, our data also allow us to delve into the specific purposes of communication aid projects that each donor prioritizes by categorizing financing projects into four distinct sub-categories:[17] (1) information communication technology (ICT), (2) Media, like television, print, or radio (3) Telecommunication, and (4) Financing and Administration.[18] Figure 2 breaks down the total disbursements of each donor from 2000 to 2017 by the four sub-categories. It

[16] It remains unclear whether and how a new Trump administration would continue, maintain, or evaluate the program. However, given the new Trump administration's track record of reducing foreign aid, support for ICT development and technological advancement in developing countries may also face significant cuts.

[17] We identified that ODA-like and OOF-like projects are almost evenly distributed across four specific purposes of communication aid: ICT, media, telecommunication, and finance. For example, a telecommunication-focused project aimed at enhancing telecommunications infrastructure, such as mobile networks and broadband systems, is almost equally likely to be classified as an ODA-like or OOF-like project. In other words, when examining the specific purposes of funded projects, we do not observe significant differences between ODA-like and OOF-like classifications in these sub-categories.

[18] For the United States and the World Bank, these categories were easily constructed using existing purpose codes available in the CRS data. For China, these categories had to be constructed using project description text. To identify similar categories to those present in the Western donor data, we conducted a data-driven topic modeling analysis using LDA (Latent Dirichlet Allocation). See Appendix A1 for the details.

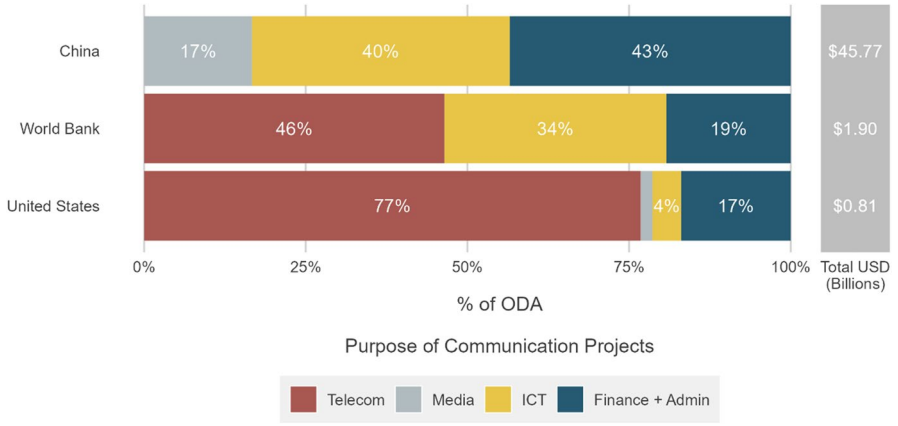

Fig. 2 Purpose of communication aid projects by donors, 2000–2017

shows a stark contrast between Chinese communication aid and those from Western donors. In addition to spending far less than China on communication aid (only 0.81 billion USD), the vast majority (77%) of aid disbursed from the United States goes toward telecommunications. Meanwhile, only 4% goes toward ICT, and only 2% goes toward media. 17% is allocated toward financing and administration. Though meager compared to China, relative to the United States, the World Bank spent nearly triple on communication aid from 2000 to 2017 (1.9 billion USD). As a share of the aid that it spends, 46% goes to telecommunications, 34% to ICT, and 19% to financing and administration purposes. The World Bank does not disburse any aid toward the media sector. Meanwhile, China, spending several times more on communication aid (45.77 billion USD) than both the United States and the World Bank combined, spends the majority of this aid on ICT projects (57%). This is followed by other administrative or financing purposes (33%) and media-based projects (10%).

Finally, the geographic distribution of communication aid recipients also differs among these three donors. Figure 3 has three panels with a map of the world. Each map shows in red countries that have received communication aid from each of the donors of interest in at least one of the years from 2000 to 2017. China by far is the least targeted in its choice of communication aid recipients. Nearly all of Africa,

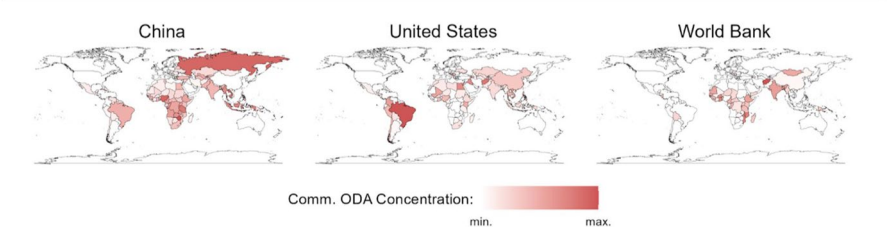

Fig. 3 Geographical distribution of ODA communication projects by donors, 2000–2017

the Middle East, Eurasia (including Russia), and Southern Asia have received some kind of communication aid from China from 2000 to 2017. Mexico, several other countries in Central America, and a majority of countries in South America has also received communication aid from China. The United States is also active in a large number of recipients, but its efforts are much more targeted in Mexico and Central and South America. The World Bank is the most geographically targeted among these donors. Nearly all of its communication projects have been in Sub-Saharan Africa and Southern Asia.

Taken together, these descriptive findings highlight the stark differences in both the scale and focus of communication aid between China, the United States, and the World Bank. China's aid allocation surpasses both the World Bank's and the United States' in terms of expenditure, with projects totaling in the billions compared to the hundreds of thousands to millions spent by the others. Moreover, China predominantly directs its aid toward promoting ICT projects in aid recipient countries. Additionally, China's communication aid reaches a wider array of countries across the globe, showcasing its expansive global outreach.

The difference in the size and scope of China's communication aid relative to the US's and the World Bank's means that if China's activities do negatively affect internet freedom in developing countries in ways that cross-cut with the impact of Western aid, the effect of China's communication aid may negate any positive effects Western aid might provide.

Data and Empirical Strategy

In this section we describe the data and methods we use to examine the relationship between communication aid projects from different donors and internet freedom in recipient countries by using cross-national panel data. We assemble annual time-series cross-country data capturing the size of communication aid projects and aid projects in all other categories funded by China, the United States, and the World Bank. The dataset covers the period between 2000 and 2017 and 145 developing countries across Africa, the Middle East, Asia, Latin America, and Central and Eastern Europe.[19] The unit of analysis is recipient-year.

Dependent Variables

To explore the effects of communication aid on different aspects of internet freedom, we use the following six indicators provided by the Varieties of Democracy (V-Dem) Project. Specifically, we are interested in assessing the efficacy of

[19] We excluded country-years classified as "high income" from the analysis, as such countries rarely receive foreign aid. For instance, among the 52 countries designated as high-income, only four have ever received communication aid from China, and none have received such aid from the World Bank. The list of high-income countries was obtained from the World Development Indicators, available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

government measures in censoring, shutting down, and monopolizing the flow of information on the internet and social media platforms.

We first examine how frequently the government shuts down domestic access to the internet by utilizing the V-Dem *Government Internet Shutdown in Practice*. We reversed the original V-Dem scores for ease of interpretation, such that higher scores now indicate greater government interference with domestic internet access, while lower scores represent less frequent government-led internet shutdowns. Governments may choose to block the flow of information by selectively screening undesirable content rather than resorting to complete shutdowns of internet access. We examine how successfully the government censors information on the internet by blocking internet access to sites or contents critical of the government (*internet censorship effort*). Higher scores indicate successful internet censorship by the government and lower scores indicate a high level of internet freedom and unrestricted internet access. In some countries, certain monitoring and online content regulations are offloaded to private actors, such as internet service providers, while other states limit private actors' involvement in monitoring and regulations. We examine the level of *government's domination on online monitoring and regulations* by utilizing the V-Dem *Government online content regulation approach* scores. Higher scores indicate that all monitoring and regulations are done by the state while lower scores indicate that the state offloads online monitoring to private actors.

Given the rising importance of social media in spreading political discourses and ideas, we also examine the government's effort to shut down, censor, and regulate social media (as opposed to general internet regulations) and how it is related to communication aid projects funded by different types of donors. First, we examine how frequently the government interferes with citizens' social media usage by shutting down access to social media platforms by utilizing *government social media shutdown in practice*. Higher values indicate a frequent social media shutdown initiated by the government while lower values indicate no government interference with access to social media. Next, we utilize *social media censorship* to examine how successfully the government censors political content by deleting or filtering specific posts for political reasons on social media. Higher values indicate a higher level censorship on social media with political content while lower values indicate no government censorship over political content on social media. Lastly, we utilize *Government social media alternatives* to measure the extent to which social media platforms are dominated by the government or its agents in the country. The higher values indicate a higher level of government domination of social media usage. The existence of alternative social media is important as it affects the extent to which elites can successfully control the spread of anti-regime information on social networks and the extent to which social media can be used as a political weapon by opposition elites. A study based on surveys in Russia, for example, finds that usage of alternative social media not dominated by the government (such as Facebook or Twitter) increased respondent's perception of electoral fraud whereas the usage of social media platforms dominated by the government (such as VKontakte and Odnoklassniki) did not have the same effect on increasing the perception of electoral fraud (Reuter and Szakonyi 2015).

Independent Variables

The key explanatory variable is the amount of aid flows from different types of donors (i.e., China, the World Bank, and the United States). We use the data collected by AidData's Global Chinese Official Finance Dataset (Dreher et al. 2021) for Chinese aid and OECD Creditor Reporting System data for the World Bank and US aid. To examine if the expected negative associations between Chinese aid projects and internet freedom are mainly attributed to communication aid projects, we distinguish between projects related to communication and other ODA sectors.

As many anecdotes tell, one of the major players in Chinese communication development projects is Huawei Technologies Co., Ltd. ("Huawei"). Whether Huawei should be treated as an official donor or whether it should be treated as a state-owned enterprise, however, remains a controversial issue. AidData, for example, counts projects supported by official commitments from China that Huawei conducted as official aid projects. However, it excludes projects backed by financial commitments from Huawei from the official aid project dataset. Instead, it reports the projects backed by financial commitments from Huawei separately, which includes 153 projects worth $1.4 billion in 64 countries.

Given the importance of Huawei as a single actor that funds communication aid projects and transfers technology that can potentially undermine internet freedom in recipient countries, we added the amount of communication aid projects funded by Huawei to measure the size of Chinese communication aid projects.[20] Most projects from Huawei are in the communication sector, which focuses on the provision of telecommunications and surveillance infrastructure and equipment (Carter and Carter 2022). However, around 30% of projects funded by Huawei are only indirectly related to communication technology. Since we are interested in the role of communication aid projects, we did not include projects funded by Huawei but unrelated to the communication sector when calculating the total amount of communication aid projects funded by China.

For the latter (i.e., the amount aid not in communication sectors), we aggregate projects in all other categories to see if the expected negative (positive) association between China's aid (aid from the US and the World Bank) and internet freedom is mainly attributed to communication aid projects.

Following the existing empirical studies, we treat observations with no relevant records of aid projects to have zero amount (e.g., Brazys & Vadlamannati 2021; Dreher et al. 2018). Then, we take the log of (one plus) aid amount as a share of gross national income. Since aid inflow fluctuates largely across years, we use the three-year average of the measure (Ping, Wang, and Chang 2022).[21]

[20] While Huawei is an arguably important actor, it is important to note that the communication aid projects funded by Huawei account for only a small share of the total amount of communication aid funded by China. In the appendix, we replicated our main results with a measure of Chinese communication aid projects that exclude Huawei-funded communication projects (See Table A11 through Table A14). The negative relationship between Chinese communication aid and various measures of internet freedom still holds.

[21] We replicate main analyses with the five-year average of the measures as a robustness check. The results remain largely similar. See Appendix A7 through A10.

Control Variables

We control for factors that may account for variation in internet freedom and are potentially correlated with our explanatory variables—i.e., aid from different types of donors. First, we control for a recipient country's size of economy by adding *GDP (in log)*. Controlling for the size of the economy addresses the possibility that countries with larger markets are less likely to receive aid from China.

Next, we added a measure of *internet penetration level* proxied by the number of Internet users as a share of the total population. Adding this variable addresses the possibility that leaders in countries with a lower level of internet penetration are less inclined to restrict internet freedom as they worry less about the potential that the internet would facilitate protests or spread information unfavorable to the regime. However, as connectivity increases and more citizens begin to actively exercise their freedom of expression online, governments may come to see the internet as a growing risk—prompting them to implement censorship and tighten control over digital spaces. Conversely, a high level of internet penetration may undermine the state's effort to effectively restrict internet freedom. A study based on cross-national analyses of internet freedom, for example, finds that higher internet and mobile coverage are negatively associated with the regime's effort to censor content or block internet access, especially in autocracies (Chang and Lin 2020). Countries with less-developed internet infrastructure are also more prone to accept the Beijing-style digital authoritarian norms, which may result in the further erosion of internet freedom (Tucker et al. 2017). Relatedly, some may wonder whether Chinese communication aid is primarily directed toward countries with limited internet access, and whether this, rather than the spillover effects of Chinese censorship techniques or manipulation by recipient countries, explains the observed negative relationship between Chinese communication aid and internet freedom.[22] If China deliberately targets its communication aid to countries with restricted internet access, it could still lead to improvements in internet freedom. However, due to the inherently constrained internet environment in these countries, any positive changes might not be fully reflected in the internet freedom score, which could appear artificially suppressed.

Leaders experiencing *coups*, upcoming *elections*, and various types of *political instability* may have more incentives to restrict internet freedom. The rise of political opposition, criticism against the government, and escalating levels of social unrest prompt leaders to restrict internet freedom not just in autocracies, but also in developed democracies (Meserve and Pemstein 2018). Leaders facing these challenges may also be more inclined to receive communication aid from China. To address the possibility that various sources of social instability encourage leaders to further restrict internet freedom, we controlled whether the country experienced any coup attempts (Powell and Thyne 2011) and how many national-level elections were held in a given year (Hyde and Marinov 2012). We also control for the level of political stability and absence of violence drawn from the

[22] To address this concern, we conducted a regression analysis to examine the relationship between internet penetration levels and Chinese communication aid. Specifically, we tested whether lagged internet penetration levels predict the flow of Chinese communication aid to a given country. The results, presented in Appendix Table A17, indicate no significant relationship between existing internet access levels and the inflow of Chinese communication aid.

Worldwide Governance Indicator (WGI). We incorporate varying levels of government effectiveness into our analysis to account for the fact that transparent and efficient governance is less inclined to regulate the internet, while corrupt administrations are motivated to curtail internet freedom (García-Sánchez, Cuadrado-Ballesteros, and Frías-Aceituno 2016). We use the government effectiveness measure drawn from the WGI.

Next, we control for the media environment of each country, which measures how frequently and routinely major print and broadcast outlets criticize the government. Controlling for the level of media freedom also addresses the concern countries that are more concerned about controlling public opinion are more interested in developing ICT and receiving ICT aid from authoritarian donors as a tool to effectively control the flow of information (Rød and Weidmann 2015). The availability of alternative information against the government, which can be fed into online space, also affects the extent to which the internet (and social media) can be politicized by political opposition (Reuter and Szakonyi 2015).

Lastly, we control for the regime type of each recipient country to address the possibility that democracies are more likely to respect internet freedom than autocracies. Controlling for the regime type of recipient countries also addresses the concern that Chinese aid, especially communication aid, is more likely to be directed to autocratic regimes than democratic regimes. This variable is derived from the V-Dem's Regimes In the World Indicator which categorizes regimes into four types: closed autocracy, electoral autocracy, electoral democracy, and liberal democracy. We coded the first two categories as autocracy and the last two categories as democracy to create the binary variable, democracy. The summary statistics are presented in Table 2.

With these variables, we estimate the following model:

$$\begin{aligned} \textit{The Erosion of Internet (SocialMedia) Freedom}_{i,t} = a + \beta_1\, & \textit{Chinese Comm Aid}_{i,t} \\ & + \beta_2 \textit{Chinese Other Aid}_{i,t} + \beta_3 \textit{US Comm Aid}_{i,t} \\ & + \beta_4 \textit{US Other Aid}_{i,t} + \beta_5 \textit{WB Comm Aid}_{i,t} \\ & + \beta_6 \textit{WB Other Aid}_{i,t} + X_{i,t} + \lambda_i + \gamma_t + \mu_{it} \end{aligned}$$

Where the outcome is a measure of the erosion of internet (social media) freedom in recipient country i in year t. We are interested in β_1, the coefficient on the logged amount of Chinese official financial flow in communication sectors, which would be positive and statistically significant if Chinese communication aid is eroding internet freedom in recipient countries. We also expect the coefficients for other aid projects or communication projects funded by other donors (namely β_3 through β_6) not to be positive and statistically significant. The model includes a set of control variables for country i in year t. Our model also includes λ_i, a vector of country-fixed effects, to control for country-specific factors related to internet freedom. The model also includes γ_t, a vector of year-fixed effects, to account for temporal trends in internet freedom over time.[23]

[23] To address concerns about having more than one set of fixed effects in a model (e.g., Kropko and Kubinec 2018), we re-estimated our models by replacing the year-fixed effects with a year trend variable. The results are reported in Table A6. The results of the replicated models without year-fixed effects remain largely the same, showing the negative relationship between Chinese communication aid projects and internet freedom.

Results

Table 1 presents the analysis results.[24] In models (1) through (3), we examine the relationship between aid and the erosion of internet freedom, featured by the government-led internet (social media) shutdown. Models (4) through (6) focus on the censorship while Models (7) through (9) focus on the government domination of the internet landscape. In all models, positive (negative) coefficients correspond to greater (lesser) erosion of internet freedom.

In models (1), (4), and (7), we only include the size of Chinese communication aid projects and Chinese aid projects of other categories. In models (2), (5), and (8), we add the size of communication aid projects from the two major traditional donors (i.e., the World Bank and the United States) as well as the size of aid projects of other categories funded by these donors. Adding the level of aid projects from the major Western donors in the model is important as their presence may mitigate the influence of Chinese aid projects (Arnold 2023). In addition, given the heightened competition between the US and China, the size and location of aid projects funded by China is likely to be influenced by the presence and size of aid projects from the US or the World Bank (Brazys, Elkink, and Kelly 2017). More importantly, the presence of Chinese aid projects may encourage traditional donors to deliver fewer conditions to recipient countries than they would otherwise do (Hernandez 2017). In Models (3), (6), and (9), we included a battery of control variables that may affect the level of internet freedom and the flow of aid projects from different donors.

To recap, we hypothesize that Chinese communication aid has a positive association with the erosion of internet freedom in recipient countries while communication aid from the World Bank or the United States has no such association. We also expect that the positive relationship between Chinese aid and the erosion of internet freedom is attributed mainly to communication aid projects. In other words, we expect that Chinese other aid projects that are not related to communication have little influence on the erosion of internet freedom in recipient countries.

Table 1 shows that the main coefficients of Chinese communication aid are positive across all models, and statistically significant. It suggests that a larger presence of Chinese communication aid projects is positively correlated with the erosion of internet freedom in recipient countries. Specifically, Chinese communication aid projects are associated with more frequent internet shutdowns by the government, more successful censorship of internet content by the government, and a higher level of government domination of online monitoring and regulations. As expected, Chinese aid to other categories does not show such a positive and significant association when it comes to the erosion of internet freedom measured by the frequency of internet shutdowns and censorship practices. A larger Chinese aid to other categories shows a positive association with internet freedom measured by the government domination on regulations and monitoring, but the size of the coefficient is smaller than the coefficient of Chinese

[24] We conducted a power analysis to identify a minimum detectable effect of Chinese communication aid on each of our main outcome variables. Our findings indicate that the study is underpowered, but only slightly. A more detailed discussion of this analysis is provided in Appendix A2.

Table 1 Aid and the erosion of internet freedom

	Shutdown			Censorship			Gov dominance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Chinese Comm aid	6.8272*	6.9292**	4.7147+	11.9409+	11.8348	11.4692+	6.7736*	6.9376*	5.3703+
	(2.617)	(2.599)	(2.425)	(7.075)	(7.201)	(6.707)	(2.930)	(2.913)	(2.820)
Chinese other aid	0.5976	0.4295	−0.0000	1.9253	1.6638	0.7534	1.4308+	1.3750+	1.2259+
	(0.959)	(0.950)	(0.778)	(1.491)	(1.452)	(1.021)	(0.766)	(0.745)	(0.626)
WB Comm aid		− 0.6724	− 2.3921		− 5.9721	− 1.8203		− 1.5314	-1.7188
		(3.188)	(3.387)		(7.370)	(4.375)		(2.610)	(2.518)
WB other aid		− 0.4589	0.3959		− 2.5866**	− 1.0968		− 0.1006	0.1374
		(0.768)	(0.693)		(0.949)	(1.128)		(0.434)	(0.480)
US comm aid		− 2.7548	− 1.3248		− 2.0797	0.9119		− 0.3401	1.1283
		(2.445)	(2.232)		(2.452)	(2.079)		(2.268)	(1.218)
US other aid		− 2.0546	− 0.6617		− 1.2838	2.7408*		− 1.1462	0.9425
		(1.916)	(1.595)		(1.796)	(1.315)		(0.784)	(1.065)
Observations	2037	2037	1834	2035	2035	1833	2037	2037	1834
Countries	122	122	120	122	122	120	122	122	120
Control variables	No	No	Yes	No	No	Yes	No	No	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors presented in parentheses †$p < 0.10$, *$p < 0.05$, **$p < 0.01$. The coefficients for control variables are reported in Table A3 in the Appendix

communication aid projects. This result supports our theoretical expectation that the positive association between Chinese development projects and the erosion of internet freedom is mainly based on communication development projects.

Conversely, the coefficients of the World Bank's Communication development projects and those of the US communication development projects are statistically indistinguishable from zero. These results suggest that, unlike Chinese communication aid projects, communication development projects from the World Bank or the US do not necessarily undermine internet freedom in recipient countries, However, these results also imply that communication aid projects from traditional donors, such as the US or the World Bank, do not successfully improve internet freedom in recipient countries.

In models (5) and (6), WB aid from other categories is negatively associated with internet censorship. However, the effect is substantially smaller than the positive effect of Chinese communication aid (on increasing censorship). We do not observe the same negative association between aid from the World Bank (or the US) and other measures indicating the erosion of internet freedom.

Table 2 shows the relationship between communication aid projects from different types of donors and the erosion of social media freedom. The coefficients of Chinese communication aid are positive across all models, although they become statistically insignificant when it comes to social media shutdown practices. It implies that Chinese communication development projects are highly and positively associated with the level of social media monitoring practices and the level of government domination of social media platforms.

Consistent with findings from Table 1, Chinese aid to other categories does not show a significant association with social media freedom. None of the coefficients of the World Bank's aid (both communication aid and aid projects in all other categories) is statistically significant either. Interestingly, the coefficients of US communication aid are negative across all models and statistically significant in models (2), (5), and (6) in Table 2. Although the coefficients of US communication aid are smaller than the coefficients of Chinese communication aid, they are comparable enough.

As a robustness check, we used the Polity score as a measure of regime type (see Table A5). The main results hold—Chinese communication aid is still negatively correlated with social media freedom, although it reaches statistical significance only for social media freedom measured by the existence of alternative social media spaces not dominated by the government. We also re-estimated the model with cohort-fixed effects, where countries with similar internet/social media freedom level are grouped as a cohort (see Table A15 and A16). The main coefficients for Chinese communication aid are negative across all models, except for internet censorship.

Additionally, to address the concern that Chinese communication aid is primarily directed toward countries that have already suppressed internet freedom, we identify a causal effect of Chinese communication aid on internet freedom. One challenge in identifying the causal effect of communication aid on internet freedom is the varying timing of aid delivery—different countries receive communication support at different times. To address this issue, we employ stacked difference-in-differences event study

Table 2 Aid and the erosion of social media freedom

	Shutdown			Censorship			Gov dominance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Chinese Comm aid	4.9018	4.8859	3.4668	7.0885^{+}	7.0277^{+}	5.5009	9.1392*	8.9445^{+}	7.1768^{+}
	(3.308)	(3.273)	(2.780)	(3.881)	(3.942)	(4.212)	(4.528)	(4.595)	(3.690)
Chinese other aid	1.6057	1.3999	0.9934	2.0717	1.8219	0.8617	1.1277	0.9631	0.4725
	(1.157)	(1.122)	(1.005)	(1.436)	(1.388)	(1.273)	(0.693)	(0.655)	(0.444)
WB Comm aid		− 2.8312	− 1.1011		− 5.3004	− 3.7407		0.4606	− 0.2647
		(4.495)	(4.124)		(5.033)	(3.658)		(2.487)	(2.445)
WB other aid		− 0.5227	0.0017		− 0.2428	0.6247		− 0.7284	− 0.1160
		(0.814)	(0.798)		(0.871)	(0.910)		(0.647)	(0.551)
US comm aid		− 4.4553*	− 0.9826		− 6.7694**	− 3.1910^{+}		− 3.7127	− 1.0608
		(1.722)	(1.484)		(1.953)	(1.744)		(2.509)	(1.830)
US other aid		− 1.9978	0.3207		− 2.4496*	0.8780		− 0.8412	1.3529
		(1.837)	(1.488)		(1.168)	(1.619)		(1.026)	(1.054)
Observations	2037	2037	1834	2035	2035	1833	2037	2037	1834
Countries	122	122	120	122	122	120	122	122	120
Control variables	No	No	Yes	No	No	Yes	No	No	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors presented in parentheses †$p < 0.10$, *$p < 0.05$, **$p < 0.01$. The coefficients for control variables are reported in Table A4 in the Appendix

models where the communication aid projects are lined up in event time. It allows us to evaluate the effect of aid over time, both before and after the aid was given. Figure 4 presents the effects of communication aid on various measures of internet/social media freedom with a 90% confidence interval both for the 4-year pre-treatment periods and the 4 post-treatment periods. Here, the countries where the communication aid was never granted serve as controls (for both pre- and post-time in the treatment).

In the year aid is given and in subsequent years, we observe a positive average treatment effect on treated countries, indicating a more frequent internet (social media) shutdown, censorship, and government dominance of internet (social media) space. While the effect does not achieve conventional statistical significance in every post-treatment year, it is statistically significant at least in the year aid is provided and the year after (t+1) in most models.

While these results provide suggestive evidence that Chinese communication aid undermines internet freedom in recipient countries, the extent to which Chinese communication aid erodes internet freedom can vary widely across recipient countries. Specifically, the increasing effect of Chinese communication aid on eroding internet freedom can be more pronounced in autocratic recipient countries where leaders have more incentives to abuse ICT technology to monitor dissent, control freedom of expression on the net, and censor information unsavory to their eyes. Authoritarian regimes and backsliding democracies may have more incentives to emulate practices developed by established authoritarian powers, such as China and Russia, when setting their digital governance standards (Tucker et al. 2017). To discuss how and whether the effect of Chinese communication aid varies across recipient countries, we conduct subgroup analyses where the countries in the sample are divided by their regime types. Table 3 shows the replication results with the six indicators of internet and social media freedom in autocratic recipient countries. Table 4 shows the replication results in democracies.

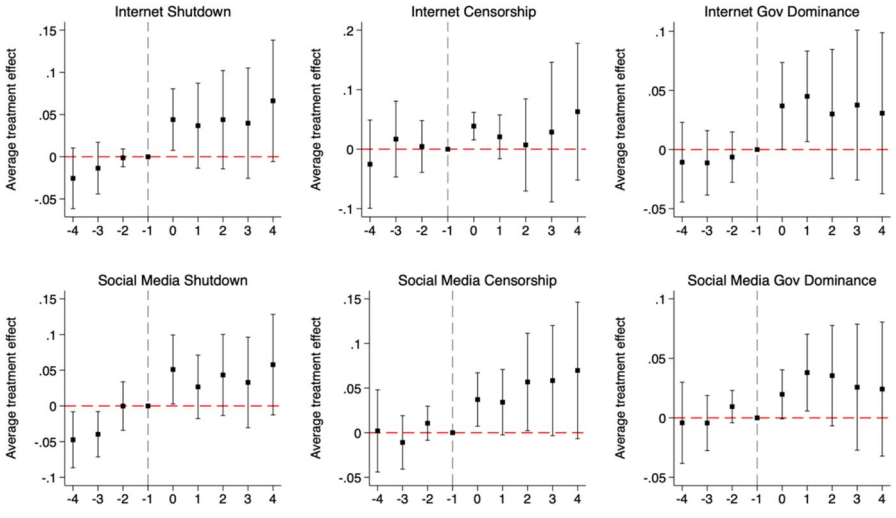

Fig. 4 The effect of Chinese communication aid on the erosion of internet and social media freedom

Table 3 The erosion of internet and social media freedom in autocracies

	Internet			Social Media		
	Shutdown	Censorship	Gov Dominance	Shutdown	Censorship	Gov Dominance
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Variables						
Chinese Comm Aid	4.0498^{+}	11.8769	5.4334^{+}	1.9268	5.6735	7.5673^{+}
	(2.424)	(7.645)	(3.206)	(3.104)	(4.541)	(4.011)
Chinese other aid	0.0562	1.1642	1.2694^{+}	1.2591	0.9911	0.9090
	(0.899)	(1.355)	(0.733)	(1.143)	(1.592)	(0.559)
WB comm Aid	-10.3660	-24.9942	-14.5546	-9.7036	-13.6796	-4.1309
	(21.792)	(43.644)	(14.548)	(27.153)	(22.659)	(12.030)
WB other aid	0.1596	-1.2128	0.0301	-1.1930	-0.2648	-0.0162
	(1.002)	(1.360)	(0.619)	(1.111)	(1.150)	(0.504)
US Comm Aid	-2.2756	0.7883	1.3942	-0.7343	-3.2982^{+}	-0.0578
	(2.160)	(2.257)	(1.100)	(1.578)	(1.787)	(1.004)
US other aid	-2.4773	0.9719	0.1785	-1.2747	-0.3537	0.6393
	(1.563)	(1.449)	(1.475)	(1.299)	(1.576)	(0.681)
Control Variables						
GDP (in log)	0.0324	0.1462	-0.0659	0.1841	0.1478	0.0766
	(0.094)	(0.103)	(0.070)	(0.137)	(0.135)	(0.050)
Internet penetration	-0.0037	0.0025	0.0006	-0.0013	0.0013	-0.0006
	(0.004)	(0.006)	(0.002)	(0.003)	(0.004)	(0.004)
Coup	0.0249	0.1889*	0.0717^{+}	0.0396	0.0158	0.0365
	(0.066)	(0.095)	(0.040)	(0.072)	(0.044)	(0.037)
Elections	-0.0153	-0.0243^{+}	-0.0046	-0.0035	-0.0089	-0.0022
	(0.011)	(0.013)	(0.007)	(0.012)	(0.009)	(0.005)
Political Stability	-0.0715^{+}	0.0195	0.0375	-0.0045	-0.0031	-0.0257
	(0.043)	(0.089)	(0.046)	(0.076)	(0.055)	(0.044)
Gov Effectiveness	0.0621	-0.0047	-0.0369	0.0675	0.0812	0.1232
	(0.088)	(0.141)	(0.053)	(0.102)	(0.111)	(0.089)
Media Environment	-0.2690*	-0.5320**	-0.2136**	-0.2324*	-0.2646*	-0.1764**
	(0.113)	(0.127)	(0.079)	(0.115)	(0.133)	(0.053)
Observations	1069	1068	1069	1069	1069	1069
Countries	90	90	90	90	90	90
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors presented in parentheses † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 4 The erosion of internet and social media freedom in democracies

	Internet			Social Media		
	Shutdown	Censorship	Gov Dominance	Shutdown	Censorship	Gov Dominance
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Variables						
Chinese Comm Aid	6.0574	3.5815	0.0722	10.4384	-8.0219	-2.8246
	(6.962)	(11.920)	(6.021)	(8.114)	(10.676)	(5.320)
Chinese other aid	-2.1774*	-0.9258	1.3168	-2.3891*	-1.0660	-0.0973
	(0.927)	(0.942)	(1.200)	(0.975)	(1.400)	(0.765)
WB comm Aid	-7.4846**	-4.6309*	-2.9966+	-6.2434**	-7.8930*	-4.6260**
	(2.150)	(2.087)	(1.788)	(2.354)	(3.569)	(1.678)
WB other aid	-0.2215	0.0124	0.1743	-0.2654	1.5502	-0.1569
	(0.898)	(0.968)	(0.526)	(0.827)	(1.232)	(0.950)
US Comm Aid	8.6609	9.7836	2.1091	-4.6939	-10.3450+	-6.4255
	(8.730)	(6.186)	(4.583)	(3.098)	(5.817)	(3.945)
US other aid	-1.1694	0.1396	0.7659	-1.8945	-3.6665	-1.2897
	(2.256)	(1.690)	(1.270)	(2.641)	(3.056)	(2.030)
Control Variables						
GDP (in log)	-0.0313	0.1211	0.0293	0.0140	0.1057	0.1013*
	(0.056)	(0.095)	(0.111)	(0.061)	(0.097)	(0.050)
Internet penetration	-0.0066**	-0.0006	0.0016	-0.0025	-0.0061+	-0.0040*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Coup	-0.0598	0.1838	-0.0426	0.0083	0.0813	-0.0074
	(0.046)	(0.173)	(0.037)	(0.103)	(0.138)	(0.037)
Elections	-0.0057	-0.0123	0.0008	0.0003	-0.0015	-0.0011
	(0.007)	(0.008)	(0.003)	(0.006)	(0.005)	(0.006)
Political Stability	-0.1172	-0.1391+	0.0250	-0.1459+	0.0225	-0.0776
	(0.072)	(0.072)	(0.033)	(0.084)	(0.050)	(0.059)
Gov Effectiveness	0.0382	-0.0500	-0.0093	0.0494	0.0043	0.0051
	(0.053)	(0.078)	(0.066)	(0.062)	(0.085)	(0.047)
Media Environment	-0.1616**	-0.2712**	-0.0529	-0.0904+	-0.2362*	-0.0273
	(0.057)	(0.073)	(0.038)	(0.046)	(0.114)	(0.025)
Observations	765	765	765	765	765	765
Countries	68	68	68	68	68	68
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors presented in parentheses † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

As shown in Table 3, the positive association between Chinese communication aid and various measures of internet (and social media) freedom remains mostly unchanged in authoritarian recipient countries. While it loses conventional statistical significance when it comes to the erosion of internet freedom measured by the presence of censorship and the erosion of social media freedom measured by the presence of social media shutdown and censorship, the coefficients of Chinese communication aid remain positive across all models and reach statistical significance in models (1), (3), and (6). However, in the analysis of democratic recipient countries, none of the coefficients for Chinese communication aid are statistically significant (see Table 4). If anything, the coefficients of communication aid projects from the World Bank are negative and significant across all models, suggesting a possibility that democratic recipient countries receiving communication aid from the World Bank experience an improvement in internet and social media freedom. In contrast, Table 3 indicates that none of the coefficients for aid projects (either communication aid projects or the aid projects in other categories) funded by the two major donors reach conventional statistical significance, suggesting that the effect of traditional donors on improving internet freedom is muted in authoritarian recipient countries.

Taken together, these results imply that the effect of Chinese communication aid and the extent to which it is used to erode internet freedom in recipient countries depends largely on recipient countries' institutional characteristics.

Conclusion

In this paper, we examine how the influence of communication aid on the internet freedom of recipient countries differs by donors. Our findings underscore that China stands head and shoulders above most Western pro-democracy donors in the realm of communication aid. Chinese assistance is substantial, not only in magnitude, but also in terms of its geographic reach.

Our analysis also shows that recipient countries that receive a larger amount of communication aid from China tend to have more restricted internet freedom. However, communication aid from democratic donors, such as the World Bank or the United States, does not seem to present a solution. While it may not directly contribute to the erosion of internet freedom, it does not improve freedom of expression on the internet, either.

More importantly, our analysis demonstrates that the difference in the size and scope of China's communication aid relative to the US's and the World Bank's means that any potential positive effects from Western aid might be insufficient to counterbalance the negative impact of Chinese communication aid. The dismantling of USAID in March 2025 and the resulting sharp reduction in funding for its aid initiatives and potential funding cut to the World Bank will only deepen this imbalance, further widening the gap in both scale and impact of Western and Chinese communication aid in the near future.

In contrast to existing literature and conjectures that attribute the negative impact of Chinese aid solely to China's intention to export digital authoritarianism, we suggest several alternative mechanisms to explain this relationship. First, we argue that the negative effect primarily arises through the contagion of business practices and regulations by firms involved in aid projects. While Chinese aid in the communication sector is negatively correlated with internet freedom, Chinese aid in other sectors does not exhibit such a negative relationship. Second, our paper finds that the adverse relationship between Chinese communication aid projects and internet freedom is more substantial in recipient countries with authoritarian governments. This finding suggests that the Chinese government's intention to set digital global standards and Chinese tech companies' capacity to bolster the leader's power better penetrates authoritarian recipient countries where the leaders have the incentive to restrict internet freedom for their own political survival. Democracies, on the other hand, are more immune to the potential negative influence coming from Chinese communication aid or the potential that it is used to bolster leaders' coercive power at the expense of citizens.

As China vigorously builds ICT infrastructure in developing recipient countries with limited internet connectivity—many of them are autocracies and early democracies—and supplies techniques that enable leaders in recipient countries to control the flow of information, it is poised to rewrite the global norms and rules governing online experiences. In addition to promoting ICT development in developing countries through aid, China has invested heavily in increasing its presence in international organizations negotiating standards for communications and digital technologies, such as the International Telecommunication Union (ITU). While China spends billions promoting ICT in the developing world, major Western donors remain largely on the sidelines, leaving China to set global rules and standards (Schaefer and Pletka 2022). China's influence is likely to affect a broader segment of the global internet landscape beyond internet users in developing recipient countries. The role of international standard-setting organizations and international donor organizations, such as the World Bank, looms larger in this context to counteract this trend. However, the U.S. withdrawal from many aid initiatives, following the shutdown of USAID in March 2025, represents a major loss of momentum and an opportunity squandered to assert technological leadership and sustain its influence in global standard-setting efforts. These changes make the prospects for communication aid in advancing internet freedom and facilitating freedom of expression in recipient countries even more uncertain.

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Declarations

Competing interest The authors declare no competing interests.

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