Chinese Aid and Human Development: The Case of Cambodia

Mathilde Perrot, PhD Student
Paris Dauphine (LEDa), DIAL

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Abstract

China's development finance program is at odd with the characteristics of traditional aid. The country's lending practices, focus sectors and implementation methods have fueled heated debates on its effectiveness as a donor. Over the last two decades, the detrimental vision of China's aid has gained most traction. I confront this claim with an empirical analysis of the effect of Chinese aid on 3 dimensions of human development in Cambodia: education, health and wealth. To do so, I use geo-referenced project data combined with demographic information from several waves of Demographic Health Surveys. Relying on an innovative Difference-in-difference method that takes heterogeneity of treatment-timing into account, I compute the average treatment effects for a selection of human development outcomes: school attendance ratios, nutritional information and access to drinkable water as well as DHS wealth index. To test whether effects are tied to different length of exposure, I look at treatment dynamics by computing effects over different time-periods since treatment. I find that none of my human development outcomes are impacted by the physical presence of Chinese aid projects. I further investigate the heterogeneity of effects across wealth levels: I do find significant effect on nutritional status and access to drinkable water for the sub-population below the wealth median and after more than 10 years of exposure. The composition of China's aid portfolio in Cambodia, as well as low projects value and a deteriorated political environment could help explain these small and localized impacts.

1 Introduction

1.1 General Introduction

According to Hun Sen, Cambodia's strong man of the last 23 years,"China has a way of doing thing. They talk less but do more. Before anyone knows it, we get bridges, roads, etc. They are all without conditions" (Prime Minister Cabinet Office, 2009). Since the emergence of China as an international donor, scholars have similarly pointed out the differences between Chinese "aid"[1] and western, or traditional, aid. In fact, China is probably the largest emerging donor in the world and owns more official credit than the World Bank or the IMF (Horn et al., 2021).

Chinese development finance emerged more than 60 years ago (Strange et al. 2013; Kobayashi, 2008). Initially used to support social leaders and anti-imperialism causes, development flows from China evolved to become oriented towards political goals, such as the recognition of Beijing instead of Taipei. But it is only after the end of the Cold War, and with the support of its exponential economic growth, that China started using external assistance at a large scale (Kobayashi, 2008; Renard, 2018). Since then, its development flows have been combined with a "Going Out" strategy[2], aimed at supporting Chinese firms in their attempt to enter developing countries large markets and tap into their abundant resources. China is now the largest emerging donor in the world and its new role has been particularly visible in Africa, under the "strategic partnership" inaugurated at the Forum on China-Africa Cooperation (FOCAC) in 2000. China's strategy was further made public to international observers in 2011 through the release of a "White Paper on China's Foreign Aid" (Strange et al. 2013; PRC, 2011).

Chinese aid model differs, in some parts, from the one of western aid. To illustrate such differences, one can rely on the classification from Chin & Gallagher (2019). First, its scale and business model: lending is done through substantial lines of credit and loans, provided by multiple Chinese actors [3] and multinational development banks (Chin & Gallagher, 2019). Resulting from the diversity of actors involved, development finance is provided under many forms: concessional and non-concessional, aid and commercial lending (Chin & Gallagher, 2019). In fact, aid from China is used as a way to facilitate Chinese firms enter dece On the opposite, development finance from traditional donor is largely provided under the form of aid and concessional loans from national or multinational development banks. Second, its approach and portfolio: allocation of aid appears to be done in a "Big push" approach

[1] In this study, I will use the terms Chinese development finance and Chinese aid interchangeably to represent China's overseas development finance flows coming from public actors. All financial flows considered in this analysis are aligned with the OECD's definitions of Official Development Assistance (ODA) and Other Official Finance (OOF), but they do not include official investment. ODA flows have a grant component of at least 25 percent and aims at improving development and welfare of recipient countries, while OOF are financial flows that do not meet either one of these two criterion. More details on these distinctions will be given in section 2. Literature review.

[2] The "Going Out" strategy was adopted in 1999.

[3] Chinese development actors represent a complex apparatus. It includes the State Council, the Ministry of Commerce (MOFCOM), China's EXIM bank and the China Development Bank, the Ministry of Finance (MOF) and the Ministry of Foreign Affairs (MOFA). MOFCOM, MOF and MOFA are the most important actors (Strange et al., 2013; Huang, 2011). There also instances where development funds are channeled through private commercial banks.

(Rosenstein-Rodan, 1943, 1961), based on the idea that coordination failures can only be overcome through massive investments in complementary sectors and areas. Aid is especially targeted towards sectors and areas deemed conducive for growth, such as the "hardware" of development: "energy generation and supply" as well as "transport and storage" (Dreher et al., 2021; Chin & Gallagher, 2019). Traditional donors on the other side, favor smaller micro-level interventions in education, health or environment, though larger amounts are made available for governance-type reforms (World Bank, 2017). Finally, on the side of governance, development finance from China is opaque and is not tied to clear policy conditionality. This is in opposition with western donors practices, even though Gallagher and Irwin (2015) have shown that sometimes, conditions on purchases and procurement for projects are added.

These differences have fueled two competing visions of Chinese as a global donor. The first one points out that China is complementary to traditional aid, as it focuses on different sectors and engages with countries that do not necessarily work with traditional donors. Furthermore, China possesses tremendous resources, unmatched by traditional donors, which can generate the "big push" that poor countries need to get out of poverty (Rosenstein-Rodan, 1943, 1961). The opposite vision of a "dangerous" China, has expanded over the years and is reinforced by the opacity and secrecy surrounding the country's development flows[4]. Supporters of this vision argue that China provides "predatory" or unconditional aid, to serve its own interests. Such interests are mostly thought to be preferential access to developing countries primary commodities and markets (Naím, 2009; Strange et al., 2013; Chellaney, 2019). One of the main mechanism for this effect has been thought to be "white elephants" projects financed in developing countries through large non-sustainable loans, in order to later exchange debt against geopolitical and economic concessions (Chellaney, 2019). The supposedly support to "rogue states" due to its non-interference policy is additionally accused of putting competitive downward pressure to the existing aid system (Woods, 2008; Hernandez, 2017; Dreher et al., 2021). Finally, China faces regular accusations of environmental and labor laws violation in recipient countries, during projects' implementation phase. Critics make similar arguments concerning financial flows channeled through the Belt and Road Initiative (BRI)[5].

This negative vision of China seem to imply an altruistic allocation of aid from western donors. But many studies have actually showed western aid allocation to be entrenched in political and strategic interests (Kuziemko & Werker, 2006; Vreeland & Dreher, 2014; Öhler & Nunnenkamp, 2014). Furthermore, studies investigating the supposedly positive effects of traditional aid have found mixed evidence. Thus, it remains to be seen whether the characteristics of Chinese development finance truly impede its projects from fuelling any positive outcomes on the ground.

Empirical analysis on the effectiveness of aid and Chinese aid are numerous but studies on its impact on human and social development indicators have been largely overlooked by the literature up until very recently (Mandon & Woldemichael, 2023; Martorano et al., 2020; Cruzatti et al., 2020). Yet, the importance of education or health for a person's life

[4]The complex apparatus of Chinese development institutions contributes to the opacity of its presence overseas. Contrary to countries such as France or Australia, China does not have a unique Development institution.

[5]Indeed, while BRI projects involve larger loans and an increase in portfolios, the sectoral or geographical composition of China's development finance has not been modified (Malik et al., 2021).

has been well documented (Cruzatti et al., 2020; World Bank, 2018). While China might appear to be more focused on infrastructure and energy rather than in education and health, looking at figures in number of projects rather than financial commitment reveal a slightly different picture. Projects in the social sector like education, health and governance are a lot smaller than infrastructure and energy projects in financial size, but in fact represent a larger number of overall projects (Dreher et al., 2021). China is notably well-known for being very present in the health and education sectors in Sub-Saharan Africa (Strange et al., 2017; King, 2010; Bräutigam, 2009; Morgan & Zheng, 2019). Moreover, changes in human development indicators also result from relevant economic spillovers; Chinese projects in transportation and energy infrastructures could generate exactly those economic changes.

1.2 Problematic and Change Theory

China's business model, its lending portfolio and governance conditions differ from those of traditional donors. These differences have been used to paint a detrimental picture of Chinese development finance effectiveness in recipient countries. Most of these accusations have not relied on conclusive empirical evidence, in particular regarding human development indicators (Strange et al. 2013, Wang & Zadek, 2016; Cooper, 2019).

In this study, I investigate the micro-level effects of Chinese development finance in Cambodia empirically. As it has been showed by Martorano et al. (2020) using a multiple countries samples and simple did design, Chinese aid seems to have a positive impact on education and health at the micro level. I question whether Chinese aid can also have positive effects on a selection of human development outcomes in Cambodia, through a combination of channels. Chinese projects could impact development indicators directly with public investments in the social sector, such as education and health. Projects in these sectors would likely increase the number of hospitals and schools as well as improve the training for medical personal and teachers, which would both positively impact education and health indicators. Moreover, Chinese projects in the economic sector (infrastructure, communication, energy...) are also likely to impact human development, though in an indirect way. Better infrastructure can make social infrastructure more accessible and generate a significant increase in economic well-being due to economic spillovers (agglomeration effects) as well as cheaper and better access to energy sources (Cruzatti et al., 2020; King, 2010). Hence, better economic status can also support and reinforce improvements in human development outcomes.

Contrary to most papers on Chinese Aid that focus on Africa, I chose to focus on a single country, located in south-east Asia (Dreher et al., 2018, 2021; Guillon & Mathonnat, 2019; Guillon & Mathonnat, 2020; Martorano et al., 2020). The rise of China as a donor is indeed of great importance for its own region. This can be explained by China's global strategy and neighborhood policy combined with BRI routes and geo-strategic issues in southeast Asia (Oh, 2020). Supporting the important role of Asia in China's overseas lending strategy, figures in financial commitments (US Dollars) - rather than numbers of projects - show that Southeast Asia is ahead of Africa in terms of projects which financial value exceeds 1 b US Dollars ("mega-projects") (Dreher et al., 2021). Cambodia in particular, is the country with the highest number of Chinese projects and displays a long history of cooperation with China; it is also a poor and autocratic country, which is the perfect case-study to observe whether previously identified critics have any traction in this context. Finally, focusing

on a single country allows for a better understanding of the geographical allocation of aid at the sub-country level and facilitates the understanding of heterogeneous effects across sub-populations.

1.3 Contribution to the Literature

In this study, I investigate the effects of aid at the micro level, thereby contributing to the literature on local aid effectiveness as follows. First, I rely on geo-referenced project-data from Aiddata 1.0 and combine them with household surveys for Cambodia to investigate outcomes at the micro-level (Kotsadam & Tolonen, 2016; Isaksson & Kotsadam, 2018; Martorano et al. 2020). Second, I take an Asian country as my case-study and take advantage of this setting to investigate micro-level drivers of Chinese aid allocation. To my knowledge, this has not been done before, except in cross-country and qualitative analysis (Dadabaev, 2018; Reilly, 2012). Even though the availability of DHS data was a prominent criteria for selecting Cambodia among other Asian countries, Cambodia is a large aid recipient that has received a diverse set of projects over a long-time period. Third, I focus on a set of human development outcomes rarely - and only recently - investigated in the literature of both aid and Chinese aid (Kotsadam et al. 2018; Cruzatti et al., 2020, Martorano et al. 2020). Through this analysis, I do not find evidence that Chinese Aid has a positive impact on the treated population. But changes in welfare do not appear overnight: to better understand the pattern of Chinese aid on human development outcomes, one needs to disentangle its dynamic effects. However, looking at heterogeneous effects over different lengths of exposure does not change the initial conclusion. However, I investigate other potential sources of impact heterogeneity and find that Chinese aid does benefit the poorest population in terms of access to water and nutritional status. Fourth, I use an innovative quasi-experimental Difference-in-difference method (Callaway & Sant'Anna, 2021) that accounts for heterogeneity of treatment-timing and effect across groups of households. This model allows me to reduce the endogeneity resulting from a probable selection bias, by using an estimator that relies on both inverse probability weighting and outcome regression for inference (Callaway & Sant'Anna, 2021).

I will start by presenting the literature on which this study is built. I will then introduce the characteristics of China's presence as a donor in Cambodia and the different sources of data used to construct the final database. Then, I will present my empirical strategy and the results obtained for each model. Finally, I will conclude with a brief discussion.

2 Literature Review

2.1 Assessing Aid Effectiveness

The birth of development aid (ODA) - as it is currently defined by the DAC - is the result of a historical trajectory that began at the end of the Second World War and the implementation of the Marshall Plan. The term "Overseas Development Aid" was defined in 1972 (Scott, 2015). Nowadays, ODA must meet two criterion : being administrated to promote the "economic development and welfare of developing countries as its main

objective" and being concessional in character *i.e.* meeting the threshold for grant component as defined by the OECD. The effectiveness of development aid (ODA) has since fueled many debates and is polarized around two views. The positive one argues that development aid can end poverty through appropriate targeting (Sachs, 2005). The opposite view highlights the tremendous amount of money spent on aid and the very poor results obtained, criticizing aid as inefficient and even harmful (Easterly, 2006; Moyo, 2014; Alesina & Dollar, 2000). Whether international aid carries the potential for positive impact is still widely debated (Galiani et al., 2016; Doucouliagos, 2019) to the point of being called the most controversial debate in development economics (Qian, 2015).

This debate is rendered even more difficult when it comes to non-traditional donors such as China. First of all, China does not disclose its official aid figures in accordance with international standards. This explains that Wang & Zadek (2016) reveal a large predominance of anecdotal evidences in studies that investigate Chinese aid. Second, China is not part of the OECD Development Assistance Committee and its development flows do not meet the OECD-DAC categorizations[6] (Strange et al. 2013). Comparisons between development financial flows from China and DAC members' flows is thus doubly challenging (Strange et al. 2013). Bräutigam (2009, 2010, 2011a, 2011b) demonstrated this issue in her investigations of the many forms of Chinese development finance in Africa. Indeed, many studies and media articles tend to mix concessional and non-concessional sources of funding from China, tangling flows with different objectives, sources of financing and grand components.

Faced with these two major challenges, research conducted by the Aiddata research lab from the University of William & Mary gave birth to a series of databases on Chinese Development Finance. Based on a systematic, transparent and replicable methodology, the Tracking Under-reported Financial Flows (TUFF) methodology was first introduced in April 2013 (Strange et al., 2013; Custer et al., 2021). It was then improved over the years (Dreher et al., 2019; Bluhm et al. (2020), Dreher et al. (2021), Custer et al., 2021). Furthermore, the TUFF methodology developed a helpful categorization of Chinese official finance along OECD-DAC definitions, that better supports comparisons between donors. Chinese official development finance is thus categorized into "ODA-like" flows, "OOF-like" flows and "vague official finance". This last category encompass flows that could be either ODA or OOF but for which there is insufficient information (Strange et al., 2013). Another major advance is the introduction of geo-referenced Chinese projects data that enabled more studies to conduct analysis at the sub-national level (Martorano et al., 2020).

[6]The three OECD-DAC categories are Official Development Assistance (ODA), Other Official Flows (OOF) and Private flows. ODA is defined as "[g]rants or loans to [developing] countries and territories ... and to multilateral agencies which are: (a) undertaken by the official sector; (b) with promotion of economic development and welfare as the main objective; (c) at concessional financial terms (if a loan, having a grant element of at least 25 per cent). In addition to financial flows, technical co-operation is included in aid". OOF includes "[t]ransactions by the official sector with [developing] countries ... which do not meet the conditions for eligibility as Official Development Assistance, either because they are not primarily aimed at development, or because they have a grant element of less than 25 per cent". Finally private flows "consist of flows at market terms financed out of private sector resources (i.e. changes in holdings of private long-term assets held by residents of the reporting country) and private grants (i.e. grants by non- governmental organizations and other private bodies, net of subsidies received from the official sector)". (OECD DAC glossary)

2.2 Effectiveness and Allocation of Chinese Aid

The drivers behind Chinese aid allocation have drawn considerable interest from scholars. Specific characteristics of Chinese aid have raised suspicions of selfish allocation drivers, that would reduce its potential for development. Empirical studies however, do not unconditionally support the conclusion that China's aid allocation is more self-interested than aid from traditional donors (Hendrix & Noland 2014, chapter 5; Bader, 2015a; Dreher & Fuchs, 2015). Dreher & Fuchs (2015) use data on Chinese aid flows to highlight the importance of foreign policy interests in Chinese aid allocation, similar to traditional donors. They found no conclusive evidence that Chinese aid is driven at the national level by natural resources endowment in Africa; Cheung et al. (2011) broadened the data sample to include Foreign Direct Investment and this time, found a positive relationship between Chinese Outward Direct Investments and natural resources endowments.

These conflicting results show how important it is to disaggregate the analysis between types of flows and targeted sectors. Dreher et al. (2018) study the relationships between the different forms of Chinese aid allocated to Africa from 2000 to 2012 with political and economic outcomes. Similar to previous analysis, their findings indicate that concessional ODA flows are related to foreign policy interests but does not favor natural resources endowments nor corrupted regimes. On the other hand, less concessional OOF flows are rather driven by more commercial purposes, such as bilateral trade relations and natural resources endowments. Such a dichotomy is important according to Dreher et al. (2018), who argue that the criticisms surrounding Chinese aid is the result of an absence of distinction between development flows with different goals. Studies on the determinants of Chinese aid also looked at differences in allocation between sectors. Guillon and Mathonnat (2020) investigate allocation by sector in Africa and found that projects in the social infrastructures and services sector align with economic needs as well as foreign policy alignment, while projects in the economic sector however, appear more aligned with natural resources endowments.

The potential link between Chinese aid and corrupted regimes is investigated in a few studies that more or less support the view of Chinese aid as "Rogue aid". Broich (2017) focuses on the allocation of Chinese development finance (without distinction between ODA and OOF) to African autocratic regimes between 2000 and 2011, finding no evidence that authoritarian countries receive more Chinese development finance. Similarly, Guillon and Mathonnat (2020) showed that governance quality (autocracy, corruption) is not a factor for allocation of social infrastructure and social services; however, it is an important factor for the economic infrastructure and production sectors. At the subnational level, Dreher et al. (2019) look at the critics on an allocation of aid allocated primarily to corrupt leaders. This time, they find a positive correlation between African countries' leaders birth region and allocation of Chinese development aid. They also find that Chinese aid is not allocated to the poorest regions, similar to traditional aid (Briggs, 2017). Supported by past research, the authors claim that this concentrated allocation of aid is unlikely to be optimal at the national level in terms of development outcomes (Cohen, 1995; Wright, 2010; Dionne, 2017). This is also supported by Guillon and Mathonnat (2019) who found that Chinese health projects in Africa are allocated following the economic needs of recipient countries but not their needs in health.

Regarding Chinese aid effectiveness, the literature largely focus on its economic impacts

(Martorano et al., 2020). Dreher et al. (2019) find positive effects on growth at the sub-national level, using an instrumental variable that relies on time variation in China 's production of steel - a material used as a primary input for aid projects - and variation in the geographical probability to receive aid. Dreher et al. (2021) also find positive impacts on economic growth for recipients, two years after projects'commitments. Focusing on transport infrastructure projects, a well-known focus of China, Bluhm et al. (2018) find that Chinese development projects in transport infrastructure reduce special concentration within but not between regions. The effect of transport infrastructure financed by China was explored in other studies, notably in those focusing on the Belt and Road Initiative (BRI) (Baniya, Rocha & Ruta., 2020; Villafuerte et al., 2016; Zhai, 2018).

Another important strand of the literature on Chinese aid effectiveness focuses on governance outcomes in recipient countries. One prominent criticism displays the view that China's presence lead to increased corruption at the local level. Isaksson and Kotsadam (2018) investigated such claims, relying on the assumption that Chinese disregard for corruption surrounding local projects can lead to an increase in local corruption in Africa. Using precise geographical projects locations to define treatment, they found positive empirical results. Regarding conflict outcomes, Ghering et al. (2018) found that, on average, Chinese aid tend to lower conflict in Africa. According to the authors, these results appear to be driven by projects in two sectors, the transportation and financial sectors.

The effects of traditional aid and Chinese aid on recipients welfare however, have been largely overlooked by the literature (Kotsadam et al., 2018). At the country level, conclusions on the effects of traditional aid on health outcomes are mixed (Chauvet et al., 2009; Nunnenkamp & Öhler, 2011). Sub-national studies focusing on infant mortality in Nigeria (Kotsadam et al., 2018) and the Ivory Coast (Wayoro & Ndikumana, 2019), both find positive results. In terms of education, traditional aid has been shown to support enrolments of basic education but progresses are still to be made on educational quality (Riddell & Niño-Zarazúa, 2016).

Research investigating Chinese aid on welfare outcomes is equally sparse. Grepin et al. (2014) was the first, to my knowledge, to investigate Chinese presence as a health donor. Leveraging new databases on Chinese aid with geographically desegregated data has allowed some authors to enter this gap. Cruzatti et al. (2020) compare mortality rates at the national and sub-national level for a large database spreading across continents. They found contradicting evidence: Chinese development aid both increase infant mortality at sub-national scale and decrease mortality at the country-level. This would mean that Chinese projects do not deliver positive outcomes where they would be supposed to, close to projects locations. According to the authors, these results can be attributed to the "fungibility hypothesis": the presence of a Chinese health project will incentivize the government to investigate its resources in another location. In their study, it is the difference in the focus of Chinese health projects and governments health projects that explains the negative impact on infant mortality at the local level. Regarding education outcomes, Yang & Ma (2015) find that China contributes well to international aid in education. This has been well documented in Africa (King, 2010; King, 2014; Bräutigam, 2009). At the global level, Reilly (2015) shows that Chinese aid in education focus on targeted activities: "higher education, vocational training, Chinese language instruction (...) and school construction" with a recent focus being put on vocational training and Chinese-language instructions. I have not found any

empirical analysis on the effectiveness of these programs except for the study probably most aligned with my analysis by Martorano et al. (2020). They use geo-referenced data from Aiddata to investigate the micro-level development impact of China in Africa. They focus on three social development indicators in education and health and found that Chinese development projects increase education and reduce malnutrition. However, they rely on data aggregated at the country-year level, leading to information loss on projects specific locations, and do not take heterogeneity of treatment-timing into account.

3 Chinese Presence as a donor in Cambodia

3.1 Cambodia Profile

Cambodia is a country located in South-East Asia. While it experienced an impressive economic growth of 7.7% per year on average between 1998 and 2019 - allowing the country to access lower middle income status in 2015 (World Bank, 2020)[7] - its record in terms of human development has remained poor. Under the period studied, the human development index (HDI) evolved from 0,42 in 2000 to 0,57 in 2014 and was ranked only 143th out of 188 countries in 2014. The population has remained quite poor and unequal, with the percentage of the population living below the poverty line falling to 18,2% in 2012 (UNDP, 2010; DHS, 2014). In 2014, the country was still at a relatively early stage of urbanization, with only 19.5% of the population living in urban areas – significantly less than its Southeast Asian neighbors (ADB, 2019).

This fragility in human development indicators is part of a complex history. The country gained its independence from France in 1953 but remained marked with political instability. The Khmer rouge regime - a rural communist guerilla movement - brutally took power in 1975 and was responsible for the killing of at least 1.5 million people by 1979. The country started to heal from this tragedy under the People's Republic of Kombuchea (PRK) (1979-1989), a Vietnam-backed regime, and finally regained its political autonomy in the 1990s. Hun Sen, prime minister under the PRK government, used the post-Khmer period to construct an authoritarian and corrupted regime that persist nowadays (Peou, 2019). Under his leadership, Cambodia's economic activities have remained highly centered around agriculture and manufacture in garments (World Bank, 2014).

Despite these hindrances, several social and human development outcomes significantly progressed over the last two decades. The infant mortality rate decreased from 78 to 1000 live births in 2000 to 27 in 2014, with under-5 mortality rate following a similar trend (DHS, 2014 ; World Bank, 2022). The average education level also showed important progress both in terms of attendance and years of education[8]. International donors such as China could very well have played a part in these ascending trend in human development - a question that this paper will try to answer.

[7]The World Bank defines the lower middle-income economies as countries for which GNI per capita is between $1,036 and $4,045.

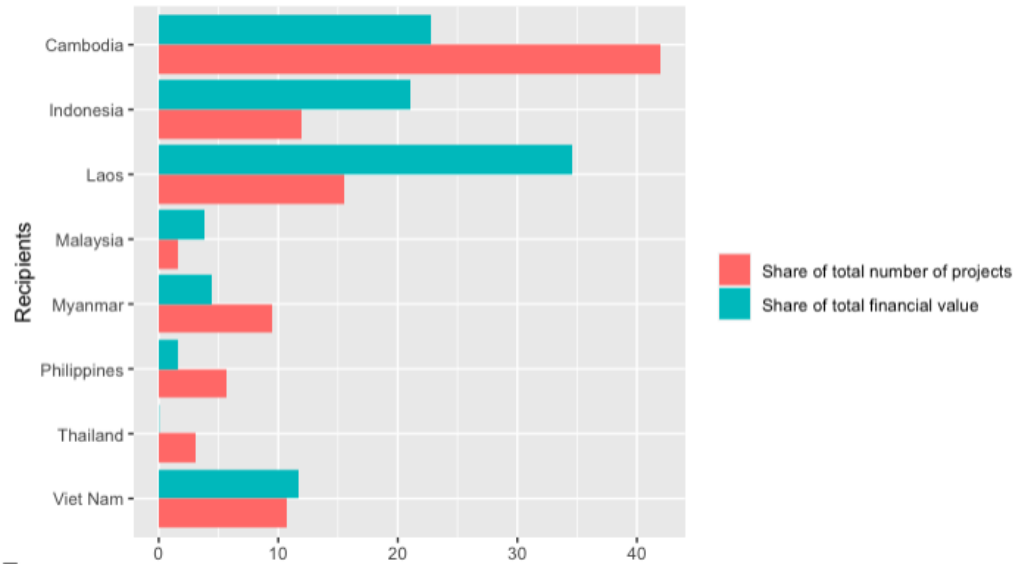
[8]Section 4 presents DHS databases used for analysis and give more information on the evolution of these indicators over the 2000-2014 period

3.2 Chinese Investment in Cambodia

China's presence as a foreign actor in Cambodia has drastically increased over the last two decades. Its envolvement is actually multifold. It is first a major foreign investor with an average of 640 million US Dollar per year from 1994 to 2005, and 5.3 billion US Dollar from 2006 to 2010 (CDC, 2012). China is currently Cambodia's biggest investor (Heng, 2012; Dunst, 2020). China is also an important trading partner: among all ASEAN countries, it is China's bilateral trade with Cambodia that experienced the highest growth during the 2000-2010 period (Heng, 2012). Finally, China is a major bilateral donor. It became Cambodia 's biggest donor in 2009 with a commitment of 257 million USD (Palit & Palit 2011). Most funding is concessional and pin-pointed for large infrastructure projects (Heng, 2012). The participation of Cambodia to the BRI since 2016 likely reinforced this trend.

Cambodia is largely ahead of its Southeast Asian neighbour countries in terms of number of Chinese development projects allocated from 2000 to 2014 (Dreher et al., 2021). The allocation to Cambodia reaches 40% of all Chinese Aid to the region in terms of number of projects, with the second largest receiver receiving only 15% (See Figure 1 in the Appendix). Looking at Chinese projects in terms of financial value rather than number of projects however reduces the large perceived gap between countries. Laos becomes the first receiver of Chinese aid, Cambodia comes second and is closely followed by Indonesia. Hence, despite having a lot more projects than its Asian neighbours, it appears that such projects, on average, do not have high face-value (see Figure 1).

Figure 1: Financial value and number of Chinese Aid as a share of the total, for East-Asian recipients from 2000 to 2014.

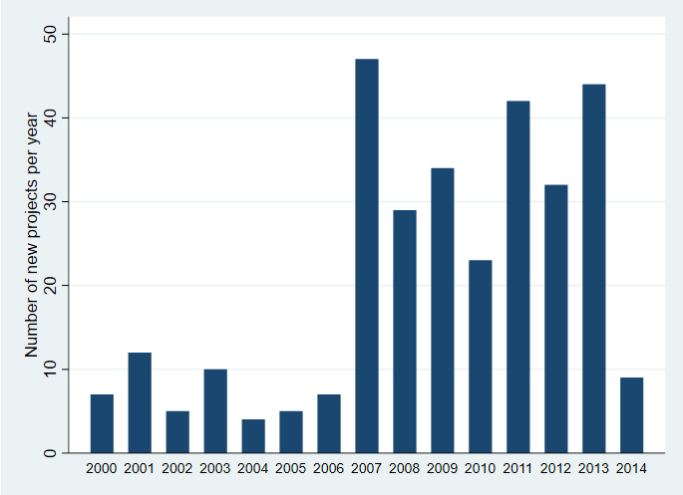


Contemporary relationships between the two countries can be officially traced back to July 1958, rekindling a relationship going back to the 13th Century. Supporting King Sihanouk in the 1960s, China then supported the Khmer rouge regime of Pol Pot[9]. The scale

[9]While the extent of China's contribution to the Khmer rouge regime is unclear, it could have been as high as 90% of the Khmer's rouge entire foreign aid (Mertha, 2014).

of the sino-Cambodian relationship took a turn after 1997 (Chen, 2018). When a military conflict between the two major political sides in Cambodia broke out, traditional donors suspended their aid flows. In opposite, China extended its full financial support to Hun Sen's political party. Since then, their financial relationship has not stopped growing, experiencing a noticeable peak in 2007 at the time of China's "boom" in development finance flows (Chen, 2018). Figure 2 illustrates well this trend.

Figure 2: Distribution of all Chinese aid in Cambodia over the 2000-2014 period, in number of projects.



According to Heng (2012), motives for this reconciliation can be traced along four lines. The main one is political: Cambodia is the strongest ally of China in Southeast Asia (Kah, 2019). It supports the "One China" policy since 1997 and Cambodia's seat at the ASEAN also helps China to shape regional security. Second, Cambodia is a strategic geographic location. The port of Sihanouk province ensure China's access to a route for its exports and energy supply. Third, there are important economic benefits to their relationship: in return for its assistance, Cambodia has granted China privileged access to Chinese public and private investments, in particular in the south of the country - a typical goal of the "Going out" strategy. Moreover, Cambodia possesses important natural resources in crude oil, gas as well as mineral resources (EIC, 2008). China has been granted concessions to invest in these strategic sectors. Economically, China partly relies on Cambodia to outsource its agriculture: from 2000 to 2010, China was the second most important investor in agriculture in Cambodia (CDC 2010). Finally, China has aimed to expand its cultural influence and values over the country.

Usual criticisms of Chinese aid could have a lot of traction in the Cambodian context. The "no-strings-attached" policy gives almost total discretionary power to the Cambodian regime. The overall lack of transparency combined with an authoritarian and corrupted regime can reinforce bad governance, local corruption and poor quality of human rights (Isaksson & Kotsadam, 2018). Michaelowa and Weber (2007) further demonstrate that high level of development aid, as it is the case for Cambodia, can generate negative spillovers, such as political capture and deterioration of governance. Degraded governance is a known deterrent of school enrolment and Chinese aid would thus have diminishing returns, notably

on primary and secondary education. This could be a important detrimental channel for any potential expected impact of Chinese aid on human development outcomes. Moreover, the focus of China on infrastructure and economic-type projects questions the ability of its aid to positively affect human development outcomes. Indeed, changes in health and education rely on improved infrastructure and economic well-being but also on behavior changes, with progresses to be made for example in professor training (Sanghvi et al., 2017). Thus, it remains to be seen whether positive human development impacts found in other studies also apply in the Cambodian context (Martorano et al. 2020, Cruzatti et al. 2020).

4 Data

This study relies on two types of datasets :

- AidData Chinese Global Development Finance dataset, version 1.0
- Demographic and Health Surveys (DHS)

4.1 Aiddata 1.0

The Aiddata Chinese Global Development Finance dataset is the largest source of information on modern Chinese development finance[10]. The entire database contains information on 4,373 Chinese development projects, for a cumulative amount of 354.4 billion US Dollar. The period spans from 2000 to 2014.

The sample used in this analysis contains information on Chinese projects in Cambodia, covering 9 sectors. Projects are sometimes separated across locations: in this analysis, I use all project-locations in the database as separate projects (Martorano et al., 2020). The database contains information on projects' geographical locations, sectors (using the OECD Creditor Report System (CSR) purpose codes), type of flows (ODA, OOF or Vague), status of completion, total financial amounts, whether a project is co-financed and start/end dates.

I proceed to some verification on the data. First, I only keep projects that are entirely financed by China by excluding projects co-financed with other donors. Most projects are either financed solely by China or co-financed by Cambodia, leading to the exclusion of only 10 projects. Second, I check for the precision level of the geographic location identified. Some projects are implemented in a limited geographic perimeter (such as a village or a town), while others are implemented at a more aggregated level (such as administrative level 1 or national level). Hence, geographic coordinates attributed to projects are always paired with the degree of precision of their location, which ranges from 1 to 8 (Strandow et al., 2011). This paper focuses on local outcomes and treatment relies on geographic distance to a project's exact location; hence, projects locations are key to the identification strategy. As a result, and following other studies (Isaksson & Kotsadam, 2017; Cruzatti et al., 2021)[11],

[10]It stems from the TUFF methodology, initiated as a mean to track under-reported Chinese development projects around the world.

[11]This is not a similar selection of projects compared to other studies (Dreher et al. (2016), Dreher & Fuchs, 2015; Briggs, 2018) which investigate outcomes at higher levels of geographic aggregations, such as ADM2.

I focus on projects whose geographic coordinates correspond to an exact location (precision 1) or as "near", in the "area" of, or up to 25km away to an exact location (precision 2). At precision level 3, locations identified are similar to a second order administrative division (ADM2, such as a district or municipality) and this goes up to precision level 8, where the location is estimated to be a seat of an administrative division or the national capital. This gives a final sample of 61 projects in Cambodia over the 2000-2014 period. By relying on this sub-sample, I restrict the analysis to projects with a physical site (Isaksson & Kotsadam, 2017) compared to more intangible projects such as bilateral agreements or donations of equipment to political entities. This analysis thus does not provide information on the effect of all Chinese aid to Cambodia, but only on the effect of being close to the physical site of a Chinese project. Third, I check that all remaining projects are either "completed" or "implemented", which is the case[12]. The starting date used to compute treatment will be the starting date of the implementation phase - which is the time at which a project should start having an impact on the surrounding population. For one third of the project sample, the exact starting date is not available and I have to impute it manually. Since I have all the agreement year for all projects, I compute the average time-gap between agreement date and actual start of completion for all projects in Cambodia that have both information [13]. Similar as noted in the literature, Chinese aid tends to be disbursed quickly, on average a little less than a year after the agreement. I thus add an average of 1 year to the year of agreement for projects with no start dates. I verify whether these make sense by comparing imputed dates with reported dates for the end of the completion phase.

The final database contains 61 projects (all project-location pairs) depicted in Figure 3. Education projects represent 6.6% of the total number, but social-type projects in general - combining education, health and other social-oriented sectors such as "social infrastructure and services"[14] - account for 32.9% of all projects. Among all sectors, the most important one is "Transport and storage" with 49.2% of all projects, followed by "Government and Civil Society" at 14.8% (see Figure 4). This is consistent with previous research about Chinese aid allocation that puts large infrastructure as the most financed sector (Guillon & Mathonnat, 2020; Chin & Gallagher, 2019).

Using the distinction between categories of financing made in Aiddata [15], one can notice that Chinese aid primarily takes the form of ODA-like flows (See Figure 3 in Appendix). Such flows represent 70% of the sample[16], in stark contrast with the distribution of Chinese aid globally. Indeed, Dreher et al. (2021) find that ODA-like flows tend to represent 21% of total financial flows every year in the world over the period 2000-2014. Even in the economic and infrastructure sector, which are predominantly financed through OOF-like flows globally (Dreher et al., 2021), ODA-like flows dominate those sectors in Cambodia. Since ODA-like flows account for projects with a development intent compared to OOF which reflect commercial interest, one could expect that the majority of Chinese aid projects

[12]Projects are either completed (75%) or being implemented (25%)

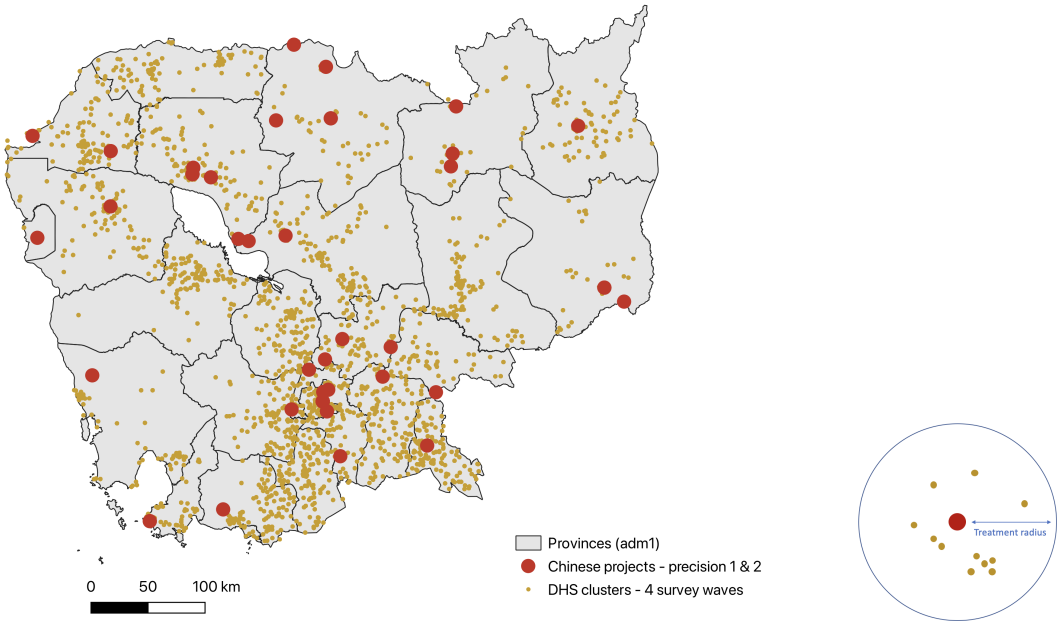
[13]119 projects out of 310

[14]Social projects are projects in the following sectors "Education", "Health", "Water supply and sanitation", "Government and Civil Society" and "Other Social Infrastructures and Services".

[15]More details on these categories are given in section 2.1

[16]Other official flows (OOF) representing 30% of all projects

Figure 3: Mapping of Chinese Development Projects, DHS clusters in Cambodia and treatment area.

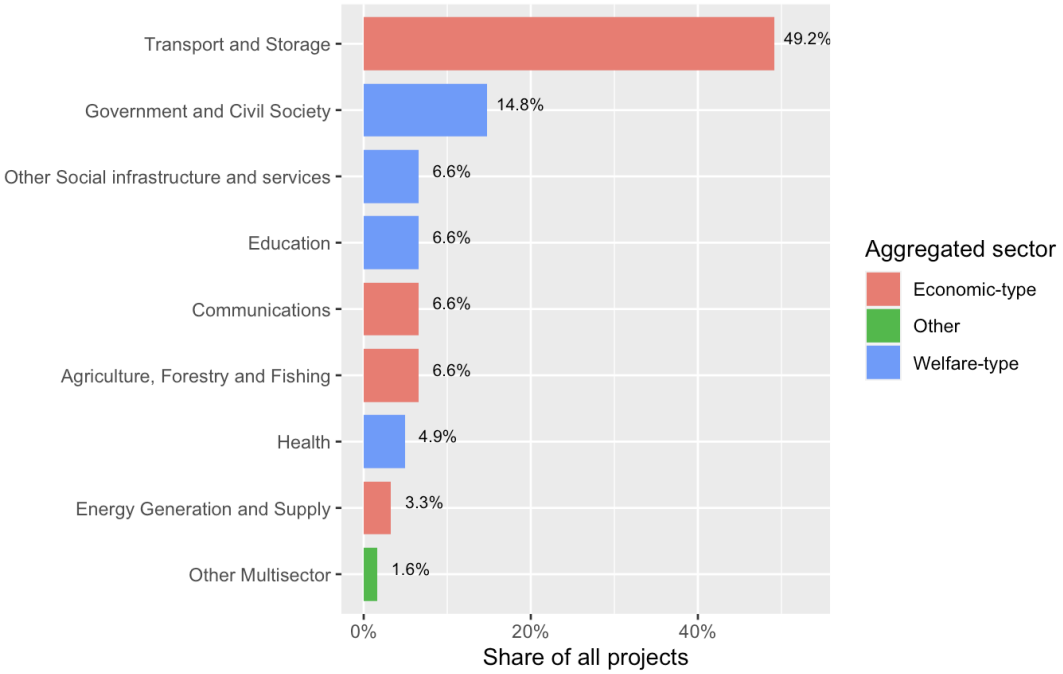


are indeed designed to further Cambodia's development and thus impact welfare outcomes. Additionally, ODA-like flows globally tend to be used to finance smaller projects which partly explains the important contrast in Cambodia between the high number and relatively low financial value of projects.

The geography of projects shows a concentration in densely populated areas, as depicted in Figure 4 of the appendix. Looking further at the allocation by province allows to see an important heterogeneity in terms of financial value but not so much in terms of number of projects. The gap between the median and mean value of project reveals that while most provinces receive small values of aid a few others receive a lot. Those provinces favored tend to be wealthier, with medium to high population density.

There are important limitation to keep in mind when using Aiddata. The first one is also the most obvious: the data stems from different sources that have not been officially confirmed by the Chinese government (Strange et al., 2013). It is unlikely that the dataset represents Chinese development finance overseas in a completely exhaustive manner. It also poses a serious threat of selection bias: development finance from China might not be allocated randomly at the national and sub-national levels. Only the second threat to my estimation can be tackled through an appropriate identification strategy which will be explained in section 4. I notably rely on inverse probability weighting (IPW) that allows me to reweight the household sample according to probability of treatment.

Figure 4: Distribution in number of Chinese Development projects by sector and aggregated sector.



4.2 4 waves of DHS

DHS surveys are part of a large-scale survey program that relies on standardized questionnaires. Repeated cross-sectional data for a country can be obtained by combining different survey waves. For this analysis I combine 4 DHS survey waves: 2000, 2005, 2010 and 2014. Depending on the outcome, I rely on different level of aggregation: I compiled a household-level database and two individual-level databases, containing information for individuals aged 5 to 24 as well as information for children under 5.

In order to assess the impact of Chinese development finance on human development in Cambodia, I focus on the following variables:

- *Education*: to be able to observe any impact on education, one must identify an education variable that is likely to evolve quickly enough to be captured by my time-frame. It is also important to target the population most likely to be directly affected by an intervention in education. Hence, I look at attendance to primary and secondary school for individuals aged 5 to 24 years old; for this sub-population, I look at gross attendance ratio (GAR)[17] to both primary and secondary school. Thus, I focus on children that were of primary and secondary age at the time of the survey. To identify the correct school-age population, I draw on the UNESCO (2020) database to obtain the official entrance age to primary and secondary school. Children kept in the sample

[17]This indicator is considered as "Gross" attendance because it looks at attendance in a level for children within the correct age range, it does not check that children of a certain age are in the correct age-group within a level.

are aged between 5 to 12 years old for primary school, and 12 to 24 years old for secondary school.

- *Health*: I look at two outcomes indicative of improvements in health that are likely to both evolve in the correct time-frame and be affected by a Chinese intervention. First, I look at the nutritional status of Children under 5, as chronic malnutrition is an important issue in Cambodia. Using anthropometric data on weight-for-age, it is measured in standard deviation from the mean: if a population is well-nourished, the distribution of children's weight at a given age should follow a normal distribution (DHS, 2000). Below 2 SD from the median of the reference population, a child is considered underweight. But nutrition is a complex variable and might need more to evolve than additional health facility or more staff - behaviour change for example might be needed. Thus, as a second health variable, I look at time needed to access drinkable water. Having access to drinkable water is key for health, as contaminated water propagates diseases and puts households at health risks that could easily be avoided. This variable could be more easily impacted by China: either through direct (through welfare-type projects) and/or indirect (through economic-type project) channels of Chinese aid. For example, time to drinkable water could be impacted by Chinese projects in "water supply & sanitation" but also by transportation projects in the economic sector, which would reduce overall time needed to travel. Time to drinkable water could be impacted by Chinese projects in "water supply & sanitation" but also by transportation projects in the economic sector, which would reduce overall time needed to travel. Because there was an important number of missing variables, data are imputed manually as the mean of the available data at the lowest level of aggregation, the DHS cluster level.

Because changes in education and health can be driven by relevant economic spillovers from Chinese projects - such as projects in the transportation sector that would reduce time to travel or create agglomeration benefits and thus increase local economic opportunities - I also check for the evolution of wealth as an important dimension of human development:

- *Index of material living conditions*[18]: this index of material living conditions will be used as a proxy for households economic well-being. It aims to capture the increased economic well-being due to Chinese projects that could in turn impact other human development indicators. This proxy is nonetheless imperfect because it reflects consumption of non-necessary goods and would only increase if Chinese projects translate into a long-term increase in economic well-being.

Descriptive statistics of these variables can be found in table 1. They confirm the ascending trend on human development discussed earlier, regarding school attendance - which is rising overall for both primary and secondary school under the period studied - as well as for health and wealth outcomes.

One limitation to keep in mind with data from DHS is that it is cross-sectional: I cannot measure the evolution overtime of variables for the same households or individuals.

[18]The index of material living conditions is built using DHS data. It aggregates household information on the type of water access, electricity, toilets and number of rooms per person in a household. This index is on a continuous scale and is higher for well-off households.

Table 1: Descriptive statistics

	(1) 2000		(2) 2005		(3) 2010		(4) 2015	
	mean	obs	mean	obs	mean	obs	mean	obs
Dependent variables								
GAR primary school	0.74	14,567	0.85	13,716	0.82	11,896	0.82	11,173
GAR sec. school	0.17	9,509	0.32	9,321	0.42	9,715	0.40	7,859
Weight / Age in SD	-1.8	3,543	-1.6	3,845	-1.6	4,030	-1.4	4,838
Time to access water	12.07	11,677	10.64	14,018	12.33	14,984	12.63	15,697
Wealth index (1 to 5)	2.82	11,677	2.93	14,018	2.91	14,984	2.96	15,697
Independent variables								
Rural residency	0.85	12,189	0.85	14,194	0.83	15,635	0.86	15,822
Dependency ratio	1.01	12,189	0.90	14,194	0.78	15,635	0.79	15,822
Size of household	5.39	12,189	5.01	14,194	4.81	15,635	4.67	15,822
Woman head of household	0.25	12,189	0.24	14,194	0.27	15,635	0.27	15,822
Age head of household	44.66	12,189	45.41	14,194	46.05	15,635	47.10	15,822
Access to electricity	0.17	12,189	0.20	14,194	0.31	15,635	0.56	15,822
Improved floor	0.91	12,189	0.91	14,194	0.93	15,635	0.92	15,822
Treatment information								
Percentage treated by year	2.00	244	20.51	2,922	39.90	6,246	54.70	8,656
Number of projects	1.0	244	2.4	2,922	4.5	6,246	6.1	8,656
Committed value	2.8e+06	244	1.4e+07	2,922	4.9e+07	6,246	7.3e+07	8,656

Nonetheless, the models used for analysis and introduced in section 4 are robust to repeated cross-section.

4.3 Geo-referenced database

I link household and individual data to project data (Aiddata) using geo-referenced information. Both DHS data and project data come with GPS coordinates, that can be used to match information. Similar to recent literature using geo-referenced data to identify the effect of aid, I consider my treated observations to be those in a 25km radius of at least one completed or ongoing Chinese project before they are surveyed (see Figure 3) Thus, my treatment variable will be defined as a dummy[19] and is irreversible - once an individual is treated, it will remain treated. One limit to keep in mind when linking DHS data with Aiddata - additionally to limits already identified - relates to the way geographic coordinates are attributed to observations. Households are grouped in clusters and attributed the same geographic coordinates. Geographic coordinates are also randomly displaced by a maximum

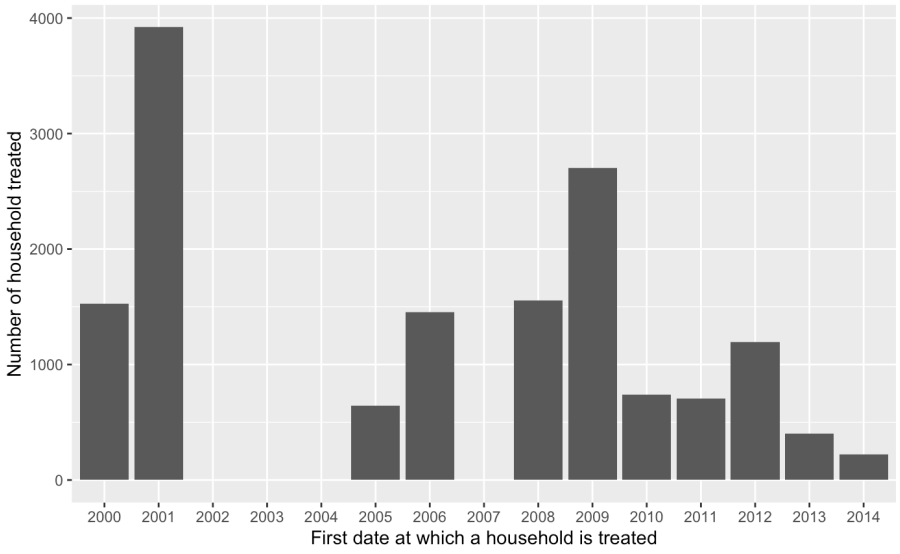
[19]One could also want to check for effects depending on treatment intensity. While looking in terms of number of projects might not be subject to large measurement error - except for low number of projects available - financial values indicated are not as reliable. Indeed, financial figures reported indicate committed values not disbursed values and they have not been officially confirmed by China - as such, they are subject to potentially important variation. Furthermore, financial commitments are only available for the whole project but not at the project site level. Thus, I will not rely on intensive treatment in my main analysis

of 5km to maintain respondent confidentiality[20]. To check whether this is an issue for my results, I will test different radius size in the robustness section.

In 2000, China was still receiving development assistance (Page & Pande, 2018) and there was little Chinese presence overseas. As a result, the majority of households in 2000 is not treated and can be used as control for computations. Among the 2000 surveyed population, the 2% treated will be considered as "always-treated" units and excluded from any computation. All post-2000 survey waves are used to compute aggregated and dynamic treatment effects. Statistics for treatment and treatment intensity can be found in table 1.

Since households can be treated many times, it is also interesting to look at the first time they are treated. Figure 5 shows that households are first treated the most in 2000 and 2002. Because treatment is irreversible and there a lot more projects implemented from 2007 to 2014 than before[21], it would seem to indicate that projects are concentrated in similar locations within provinces.

Figure 5: First date at which a household is treated.



5 Empirical Strategy and Results

5.1 Did with multiple groups and time periods

Difference-in-differences (Did) is a very popular quasi-experimental method, used to estimate causal impact. The standard version involves two groups over two periods ; it further assumes that treatment effects are homogeneous and applied at the same time for all treated units. In this analysis however, households are treated at different periods in time - depending on projects starting dates - and by different types of project.

[20]More information on the procedure can be found on DHS website https://dhsprogram.com/Methodology/GPS-Data.cfm.

[21]See Figure 2 in the Appendix

Recent methodological papers have shown that two-way fixed-effect regressions, commonly used in the literature for similar settings, have important drawbacks (Callaway & Sant'Anna, 2021; Chaisemartin & d'Haultfœuille, 2020; Goodman-Bacon, 2021). As a result, I instead rely on the semi-parametric model introduced by Callaway and Sant'Anna (2021): their model efficiently estimates the ATT in Did designs with multiple time periods, variation in treatment timing with staggered adoption, and when the parallel assumption only holds with covariates. Inference is done using a doubly robust approach that relies on both inverse probability weighting (IPW) and ordinary least squares (OLS) (Sant'Anna & Zhao, 2020).

On top of being able to efficiently estimate the ATT in this research setup, Callaway and Sant'Anna's model has three main advantages. First, it works well with repeated cross-section data. Second, by reweighting for the distribution of covariates between treatment and control groups it allows to adjust for a potential selection bias in project allocation (Horvitz & Thompson, 1952; Wooldridge, 2007; Martorano et al., 2020). It also partly deals with concerns related to an evolution in the Chinese allocation strategy: if a group B treated at a certain time possesses characteristics different than a group A treated before, group B will be matched to control units with similar characteristics as his. Conditional parallel trends can thus be specific across groups of units treated at different times (Callaway & Sant'Anna, 2021). Third, by taking better account of differences in treatment-timing, the model can be used to compute average treatment effect according to different time-periods since treatment (event-study).

5.2 Empirical Strategy

I attempt to estimate the effect of a binary treatment - with treatment defined as being in a 25km radius of a Chinese development project before being surveyed- and exploit variation in treatment-timing across groups of units. An estimation of the average treatment effect that applies to setups with multiple groups and time periods can be done by identifying the ATT "in period t for the group of units first treated in period g"[22](Callaway & Sant'Anna, 2021), denoted by:

$$ATT(g,t) = E[Y_t(g) - Y_t(0)|G_g = 1] \tag{1}$$

where G equals 1 if a unit i is first treated at time g and 0 otherwise. This means estimating different coefficients for different groups of units treated at different time g. For example, a group first treated at $g = 2005$ will have different estimates according to the period chosen $t = 2010$ or $g = 2014$. Separately estimated ATT(g,t) can be further aggregated to form a single causal ATT. It is estimated with a weighted average of all ATT(g,t), using weights proportional to group size (Callaway & Sant'Anna, 2021)[23]. For an illustration of all ATT(g,t) computed to obtain the final aggregated ATT, see table 2 in the Appendix.

The identification of the multiple ATT (g,t) relies on a basic set of assumptions[24]. The

[22]The notation g can also be referred to as "treatment starting-time" for groups or cohorts

[23]Results remain similar whether I use a simple IPW or the doubly robust approach

[24]the first basic hypothesis is random sampling (i), then irreversible treatment (ii), non-anticipation of treatment (iii)

most important, that without treatment average outcomes for treated and non-treated populations would have evolved similarly. But in this analysis, I suspect that Chinese aid is not randomly allocated and that some specific areas and individuals are more likely to be targeted. Despite the presence of covariates, individuals living away from any project site ("never-treated" units) might still behave differently from those living close to a present or future project site (treated or "not-yet" treated units). To deal with this concern, I take two steps.

First, I choose to rely on both "not-yet-treated" units and "never-treated" units as control[25]. Isaksson and Kotsadam (2018) as well as Cruzatti et al. (2020) follow a similar intuition: to reduce the selection bias, they compare individuals in locations where Chinese projects are being implemented at the time of the survey, with individuals in locations where there will be a Chinese project in the future but aid has not yet been disbursed. In the robustness section, I will test for the same setup using only "pure controls" (not-yet-treated units). This will reduce the time-frame of results but also reduce identification concerns.

Second, I use a reweighting procedure, more specifically I use the doubly robust estimator developed by Sant'Anna and Zhao (2020), that combines both the outcome regression (OR) by Heckman et al.(1997, 1998) and the inverse probability weighting (IPW) approach of Abadie (2005)[26] (Callaway & Sant'Anna, 2021; Sant'Anna & Zhao, 2020). Hence, each group treated at a given time g will be matched to a control group with similar characteristics, accounting for heterogeneity of treatment. I focus on the IPW approach to correctly define the factors used in this model. IPW is shown to be particularly robust compared to other matching methods (Busso et al., 2014; Martorano et al., 2020). I build on the literature and on the results of my descriptive analysis to identify potential drivers of Chinese project allocation at the local level and assess the strength of my hypothesis using a probit model[27]:

- Chin & Gallagher (2019) demonstrate that Chinese development finance allocation can be described as a "coordinated credit space model". Projects are financed by China through different structures (combining state banks with commercial ones), but in a coordinated fashion that supports the "big push" approach of Rosenstein-Rodan (1943, 1961). The consequences of this strategy, aimed at promoting synergies between sectors and overcoming coordination failures, are two-folds:
  - Chinese-financed projects might tend to be geographically concentrated, whether with other Chinese projects or western donor projects. To take this into account, and since disbursed amount are available and trustworthy, I test for the predictive power of the financial presence of the WB in a province, on treatment outcome.

[25]In the Callaway & Sant'Anna model, the parallel trends assumption has two alternatives, that differ by the control group they use: conditional parallel trends on the "never-treated" units or "not-yet treated". The default model does not use only "not-yet treated units as control but combines both groups to have enough observation and make full use of the time-frame available in the data.

[26]As a result, it is more robust against misspecifications than the OR or IPW taken alone. While outcome regression, IPW or a combinaison of both are similar in terms of identification, it is not for the estimation. Outcome regression necessitates to adequately model the evolution of outcomes for both treated and non-treated groups. The IPW only requires to adequately model the conditional probability of a unit i to be in group g given their covariates. The doubly robust procedures necessitates only one of those two models to be correctly identified.

[27]Results are displayed in table 1 of the appendix section

The data is retrieved from Aiddata, the World Bank Geocoded Research Release, Version 1.4.2 and takes the period 2000-2014 into account[28]. The result of the probit model shows a significant coefficient but the marginal effect is very low in magnitude. Thus, I do not use this variable as a covariate[29].

- Chinese projects are likely to be located in places perceived as conducive for development, an hypothesis supported by Dreher et al (2019) which states that Chinese projects tend to be allocated in the wealthier parts of countries. I check for this positive selection in the Cambodia context using a t-test of difference in means at baseline (2000), between population living in areas never treated and population living in areas that will be treated. The results can be found in table 2. As expected, households living in treatment areas are overall better-off than households living in never-treated areas in various dimensions: they are on average more educated, richer, take less time to reach a drinkable water source and benefit from better demographic characteristics. Hence, I use the probit model to select material conditions of living most predictive of treatment. Having access to electricity, increased quality of flooring and living in densely populated areas are all good predictors of treatment[30]. They are thus used as covariates for re-weighting.
- Demographic conditions can also be representative of better living standards. Similar to Martorano et al (2020), which use a standard Did method with a similar IPW approach to identify welfare impacts of Chinese projects in Africa, I identify a list of demographic characteristics used to model the probability of receiving Chinese development finance. The results of the probit model allow to identify the following demographic characteristics: household size, sex of the household head, dependency ratio and whether a household lives in a rural area.

- In a study on Chinese development flows in Africa, Dreher et al. (2019) identify a systematic tendency of Chinese aid to be allocated to the birth region of political leaders[31]. The current prime Minister of Cambodia Hun Sen has been in position for the last 23 years and was born in Peam Kaoh Sna in the province of Kampong Cham (Mehta & Mehta, 2013). However, descriptive statistics on the allocation of projects by province do not show that Kampong Cham receives more aid than other provinces

[28]I rely on treatment intensity to account for a higher probability of Chinese development projects to be located in provinces where there is also an important presence of other donors.

[29]This WB variable could probably be refined to fit the micro-level data better, but there are no project listed in Cambodia between 2010 and 2014, even though there seem to have been projects according to the World Bank website. Thus, I would need to code them manually.

[30]A visual observation of proximity between projects and roads (in 2022) seem to indicate that being closed to a major road is a good predictor of treatment. It is confirmed by the strong positive correlation between the two. Roads indeed favor transportation and economic gains, which in turn favor agglomeration benefits that trickle down over human development outcomes. But for the moment this variable will not be included, as I do not have been able to recover the 2000 road network and only have the current road network available.

[31]In the same study, Dreher et al. (2019) identify a less robust effect of ethnicity of birth leader. However in Cambodia, the Khmers are largely dominant and constitute 90% of the Cambodian population. Controlling for the political leaders'ethnicity does not make sense in this context of low ethnic diversity.

Table 2: Results of a Student's T-test: differences in characteristics for households living in treated areas and household living in non-treated areas, using baseline data (survey year 2000).

	(1) Average years of education	(2) Wealth index	(3) Time to water	(4) Size household	(5) Age of head of household	(6) Rural	(7) Dependency ratio
marqueur	0.75***	0.68***	-1.72***	0.04	1.78***	-0.08***	-0.11***
Constant	2.17***	2.56***	12.99***	5.36***	43.66***	0.90***	1.07***
Observations	12129	12235	11493	12235	12235	12235	12235
R^2	0.033	0.057	0.008	0.000	0.004	0.012	0.005

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

- both in terms of number of projects and their financial value. Thus I do not add this as a variable in the model.

5.3 Model

I use the identified covariates to estimate the regression for each of my ATT group-time as follow:

$$Y^g_{icpt} = \beta_0 + \beta_1 G^g_{icp} + \beta_2 T_t + \beta_3 (G^g_{icp} * T_t) + Z_{icpt} + \theta_t * \eta_p + \varepsilon^g_{icpt}$$

Y^g_{icpt} is the dependent variable for groups of units i located in a DHS cluster c living in province p, first treated during time-period g and measured of time t. G equals 1 if a unit i is first treated during g and 0 otherwise. The rest of the specification varies slightly depending on whether estimates are at the household or individual level. For household level estimates - time to water and wealth index - Z_{icpt} is a vector of characteristics for households i, living in province p over time t, including all covariates previously identified as well as population density at the DHS cluster level c. The interaction of time-fixed effect θ_t and province fixed effects η_p allows to control for time trends in provinces and unobserved provinces-specific characteristics that could be correlated with my dependent and independent variables. For estimation at the individual level, the vector of characteristics Z_{icpt} also includes gender. Additionally, cohort (age) fixed effect ρ_a is added to the interaction between time-fixed effect θ_t and province fixed effects η_p to control for potential age-cohort related events that may affect primary and secondary school attendance. Finally, ε_{icpt} is a time-varying unobservable error term.

I compute the model using clustered standard errors for the interaction of province and survey year for household level estimates, and for the interaction of province, survey year and cohorts for individual level estimates. Indeed, I expect errors to be correlated among households (individuals) from the same province (with the same age) and over time, as they will be subjected to the same unobservable factors - such as a change of policies or other common shock. Indeed, the Cambodian administration is highly centralized and provinces are the main administrative units in charge of implementing sub-national measures agreed on at the central level (OECD, 2016).

One limit has be taken into account for the estimation. Because I do not have survey data[32] for every year a household is treated (for example I only have survey year 2005 even though some households are also treated in 2002), I have to aggregate groups of households treated at different times into each of my survey years - denoted as g. As a result, I am not able to precisely distinguish between different treatment effects due to treatment length of exposure, but I can still average it within survey years. For example, households treated after the first wave of 2000 (my pre-treatment wave) and between 2001 and 2005 are considered to be treated in 2005. The same is done for households treated between 2006 and 2010, considered to be treated in 2010, and households treated between 2011 and 2014 which are considered treated in 2014.

6 Results

Before proceeding with the model, I assess the credibility of assumption (v), and proceed to a robustness test. I use a placebo-type test from Callaway & Sant'Anna (2021): it tests indirectly whether the conditional parallel assumptions hold by looking at changes in my outcomes variables before treatment. It is similar to checking whether all pre-treatment estimates are equal to 0 for all group-time (Marcus & Sant'Anna, (2021); Callaway & Sant'Anna (2021); de Chaisemartin & D'Haultfœuille, 2020). If the conditional parallel trend assumption hold, the pre-treatment effects for treated units compared to not and not-yet treated units can be expected to be 0. Results of these tests can be found in table 3. With the p-values obtained, I cannot reject the null hypothesis of a joint pre-treatment effect of 0 for any of my outcome variables, providing indirect support to the parallel trend assumption (v) (Marcus & Sant'Anna, 2020). This test will be used again in the event-study section to investigate whether conditional parallel trends also appear to hold for sub-groups exposed to the same length of treatment.

Table 3: Placebo test

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
Chi2	1.59	1.42	1.82	1.87	4.48
p-value	0.66	0.70	0.61	0.60	0.21
Obs	49,453	34,925	15,690	54,328	55,922

H0: All Pre-treatment are equal to 0

6.1 Aggregated ATTs

The results of my estimation are reported in table 4. First, I find a non-significant coefficient in column (1) and (2) regarding the probability of attending primary and secondary

[32]For each cohort in the groups g variable, there should be a period in time t otherwise the model will not produce an estimate.

school. Results are similarly non-significant for health outcomes and households material conditions of living (wealth index). This is slightly surprising given findings from Martorano et al. (2020) who find an average half a year increase in average years of education in households after around 10 years of exposure, for a sample of 13 sub-Saharan African countries. But their measure looked at households without age discrimination. In their meta-analysis, Mandan & Woldemichael (2022) also find that Chinese aid tend to improve social outcomes in general[33].

Table 4: Main results

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
Treatment	-0.01	-0.00	9.41	-1.17	0.04
	(0.02)	(0.03)	(9.20)	(1.03)	(0.07)
p-value	0.59	0.89	0.31	0.26	0.50
Observations	49,453	34,925	15,690	54,328	55,922

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Several explanations can be advanced for these results. Because improvements in human development outcomes typically take a long time to emerge, I expect average effects to differ across groups of households treated for different time-periods. Since the coefficient presented is an average of different groups exposed to different length of treatment, it could be that the aggregated ATT appears insignificant while it actually is significant for groups treated for longer periods. The literature on the subject does argue that when the effects of aid are small, the aggregate estimate might not reflect its real effect (Briggs, 2017; Dreher & Lohmann, 2015). The dynamic relationships between treatment and outcome variable will be analysed in the following section. Specifically for education variables, the absence of effect could be explained by the low share of projects in education and their low committed value compared to the total. Additionally, while even a small number of projects in education might help increase the number of years spent in primary school due to economic spillovers and/or better access to school, achieving a higher attendance at secondary level would likely require a change in behaviour and beliefs on the value of higher education. Especially in Cambodia where secondary school suffers from a structurally low attendance compared to primary school. China would need to implement education projects designed to specifically fight the cause of low attendance at higher school levels. Yet, as it was highlighted in the literature review, Chinese projects in education tend to rather focus on vocational training or Chinese language instruction. A similar point can be made on the weight-for-age outcome, with improvements in nutrition requiring important changes in behavior. Regarding the absence of reduction in time access drinkable water could be due to due to the low share of projects in "water supply and sanitation" (2,3%). It could also be that transportation infrastructures are not well tailored for this sort day-to-day need. Finally, it is important to remember

[33]Their measure includes country-level HDI, and a selection of household-level health and education level

that the proxy for economic well-being only captures household possessions. Thus, it is a more permanent measure of wealth than income or consumption. Similar to other human development outcomes, improvements in living conditions typically do not happen very fast, since it requires poor households to save money over multiple periods of time. Poor household do not often have this luxury, as their income tend to be entirely spent for immediate consumption and needs (food, water, or healthcare for a sick member of the family) (Duflo & Banerjee, 2011). Moreover, financial aid flows towards Cambodia are predominantly "ODA-like" meaning that they are directed towards achieving development goals rather than commercial/economic ones. This could translate in low agglomeration benefits and low increase in wealth for treated individuals. Finally, the overall lack of significance could also be the result of Cambodia's political environment. Michaelowa and Weber (2007) demonstrate that with high level of development aid - which could be considered to be the case here in aggregate terms, but not in terms of face-value - there can be negative spillovers, such as political capture and deterioration of governance. The presence of a corrupt government in Cambodia supports this idea. Moreover, China has been accused of favoring Chinese labor rather than local labor, which could reduce economic spillovers in the construction phase (Wegenast et al., 2017; Cooper, 2019).

6.2 Event-study

I compute the event-study parameter that is the (weighted[34]) average effect of treatment l periods after adoption for different adoption cohorts, using the model from Callaway & Sant'Anna (2021). The results are reported in table 5 and figures 6, 7, 8, 9 and 10 - with the x-axis representing different time-periods since the first exposure to treatment. Periods before treatment allow to check for pre-treatment trends based on group-time (Callaway & Sant'Anna, 2021)[35]. Because individuals considered treated in a survey year - for example 2005 - can in reality[36] have been treated before -between the end of 2000 to 2006 (end of 2005 survey) - the 0 value in all figures does not just represent the effect on individuals treated the same year as the survey but represent the effect for individuals treated for a length of 0 to 5 years. This is similar for point 5, which represent a length of exposure to treatment of 5 to 10 years and 10 which represent more than 10 years.

All plots contain pre-treatment estimates to test the parallel trends assumption indirectly across group-time with the same length of exposure to treatment. For all pre-treatment periods, whether 5 years or 10 years before treatment, treatment effects remain non-significant for all estimations. This provides additional credibility to the parallel trends (v) hypothesis.

Coefficients for different length of exposure do not alter the initial conclusions. Only gross attendance in secondary school is negatively affected in the first 0 to 5 years of treatment, but the coefficient soon becomes insignificant again. Despite for this change, the evolution of education attendance remains stable even after more than 10 years of exposure. It is striking, as having been first treated more than 10 years ago can also mean that these individuals

[34]As mentioned earlier, weights correspond to relative frequencies in the treated population

[35]The identification in event studies differ from previous ATT(g,t) identification. Periods after treatment are measured as $E(Y|t)$ - $E(Y|g_{-1})$ with g_{-1} the last period before first treatment for group g. Periods before treatment are measured as $E(Y|t)$ - $E(Y|t_{-1})$

[36]Due to data and model constraints, see 5.3 "Estimation and inference"

Table 5: Event-study results

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
10 years before treatment	-0.01	0.02	17.0	-2.05	0.05
	(0.03)	(0.03)	(14.8)	(1.47)	(0.13)
5 years before treatment	-0.02	0.01	2.94	0.80	0.14
	(0.02)	(0.02)	(9.26)	(1.26)	(0.08)
0 to 5 years after treatment	-0.01	-0.06*	0.62	-1.40	-0.02
	(0.02)	(0.03)	(7.67)	(1.10)	(0.06)
5 to 10 years after treatment	-0.02	0.00	11.4	-0.58	0.06
	(0.04)	(0.04)	(10.6)	(1.35)	(0.08)
10 + years after treatment	-0.03	0.10	26.5	-1.58	0.18
	(0.05)	(0.07)	(21.5)	(2.70)	(0.15)
Observations	49,453	34,925	15,690	54,328	55,922

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

have been submitted to a higher intensity of treatment - treated by more projects than those exposed to treatment 5 years ago for example.

It would appear that if there is indeed a slow and dynamic change in pattern in human development outcomes, it is not revealed in these variables and this environment. The effect could be either nonexistent or too small to be detected - again, it could be due to low committed financial amount combined to low number of projects in social sectors. It could also be that my time-frame is too narrow to capture the length of exposure needed for the effect to become significant.

Figure 6: Results event-study: GAR for primary school for primary-school age individuals

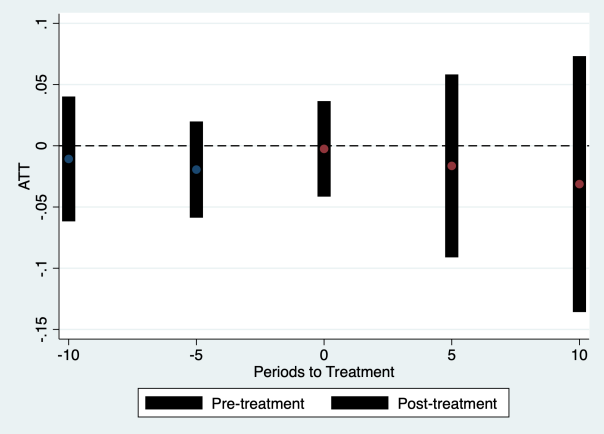


Figure 7: Results event-study: GAR for secondary school for secondary-school age individuals

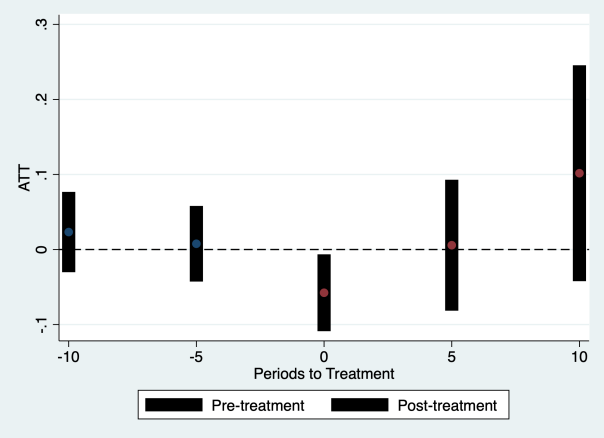


Figure 8: Results event-study: Weight for age at the individual level (children under 5)

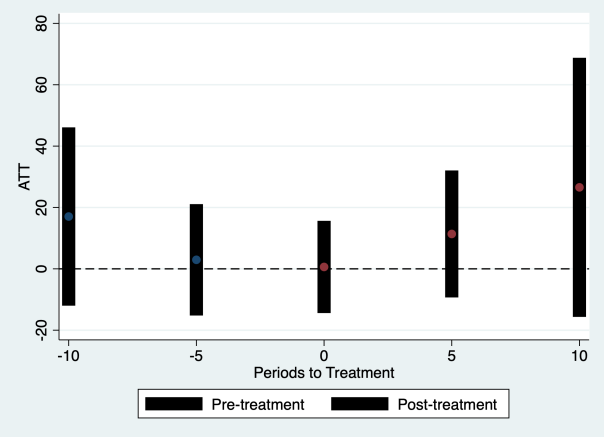


Figure 9: Results event-study: average time to drinkable water at the household level

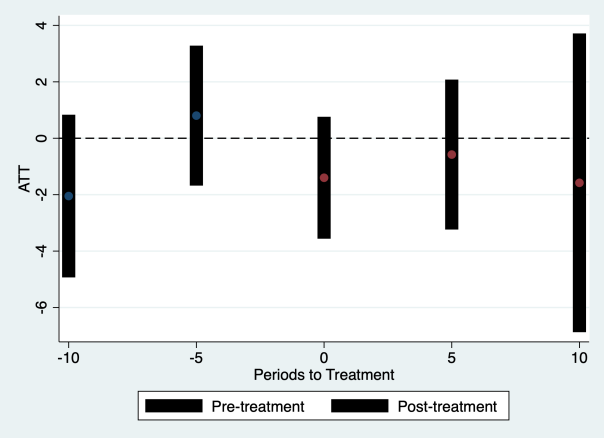
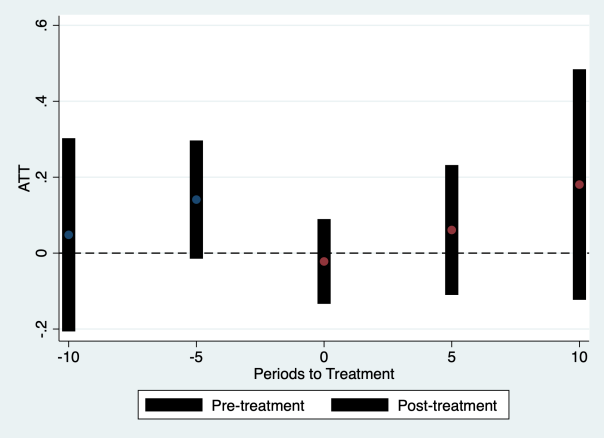


Figure 10: Results event-study: average wealth (index) at the household level



6.3 ATTs for sub-populations

One last explanation for the overall lack of significance could be that the effect is only significant for certain sub-populations but not large enough to manifest itself over the entire population. Project could be targeted to specific areas, such as richer areas, and thus benefit only those with already wealthier status. On the contrary, since Chinese intervention are likely to be small in size, they could benefit the poor population, because they have a lot more to gain. Hence, I investigate the heterogeneity of effects by looking at treatment effects on two sub-population based on their value on the wealth index (see Table 6). I split my sample at the median index value, which is 3 (over a range of 5).

This time, both outcomes for health turn significant after prolonged exposure to treatment (over 10 years) and only for the population under the median for wealth. It partly confirms the initial intuition that significant results can only be expected after a long-time period - and potentially also with higher intensity of treatment since units treated for longer time are likely to be treated more times. Coefficients for attendance to primary and secondary school remain insignificant for both groups over the long run.

Next steps for this analysis would be to look at other factors of heterogeneity, such as differences in effects for population living in different rural / urban environment and having different gender. It would also be interesting to investigate effects for different intensity of treatment - whether in terms of number of projects or projects intensity. For the latter, the literature on Did models with heterogeneity of treatment-timing has very recently started to work on such models with continuous treatment (Callaway et al., 2021). As for now, it would appear that comparing effects across different intensity requires stronger assumptions that made previously and are difficult to interpret due to treatment effect heterogeneity.

6.4 Robustness

To investigate the geographical range of my findings and dismiss any concerns regarding the slight displacement of DHS cluster locations, I compute the same model but using a different treatment zone of 50km (Isaksson & Kotsadam, 2018). Results can be found in tables 3, 4 and 5 of the appendix. Results remain similar to the 25km analysis, revealing no

Table 6: Event-study by sub-population

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water
Panel 1 : wealth index above median				
ATT(g,t)	-0.03	0.02	12.24	-0.97
	(0.03)	(0.05)	(12.75)	(1.23)
10 years before treatment	-0.03	0.06	4.05	-1.60
	(0.03)	(0.04)	(19.78)	(1.73)
5 years before treatment	-0.05	0.04	1.42	0.56
	(0.03)	(0.04)	(13.82)	(1.23)
0 to 5 years after treatment	0.00	-0.04	2.36	-2.1
	(0.03)	(0.04)	(10.54)	(1.26)
5 to 10 years after treatment	-0.05	0.00	9.71	0.01
	(0.06)	(0.06)	(15.67)	(1.56)
10 + years after treatment	-0.08	0.15	34.33	-0.09
	(0.07)	(0.09)	(25.85)	(2.99)
Observations	38,047	27,900	12,065	42,003
Panel 2 : wealth index under median				
ATT(g,t)	-0.00	0.02	14.46	-2.01
	(0.02)	(0.03)	(9.96)	(1.22)
10 years before treatment	0.01	-0.00	23.25	-2.35
	(0.03)	(0.02)	(14.94)	(1.54)
5 years before treatment	-0.01	-0.00	3.97	0.72
	(0.02)	(0.02)	(9.89)	(1.40)
0 to 5 years after treatment	-0.01	-0.01	2.03	-1.02
	(0.02)	(0.02)	(10.34)	(1.25)
5 to 10 years after treatment	0.01	0.06	14.96	-1.70
	(0.03)	(0.04)	(11.98)	(1.76)
10 + years after treatment	0.00	0.05	48.94*	-5.98**
	(0.05)	(0.08)	(22.22)	(1.94)
Observations	39,234	25,662	12,424	42,247

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

sensibility to buffer-size.

Additional robustness will include estimation with only "pure" controls, those units that are not yet but will be treated in the future. Even though it necessarily limits the temporal dimension, it could help assess the overall validity of the model and adress concerns related to identification. Finally, one last robustness test would be to re-estimate the model with lower-level geographic fixed effects, at the district level. It could be that the province fixed

effect is too large compared to the level of my treatment and dependent variable and thus does not capture all unobservable factors affecting individuals.

7 Conclusion

The scale of China's development program has expanded a lot since 2000, notably driven by large-scale initiatives such as the BRI. However, the effects of China's aid disbursements in recipient countries are still not well understood, in part due to the absence of fully exhaustive and reliable data. This has led to a body of qualitative study blaming China for providing "rogue aid" with a blatant disregard for international safeguards (Wang & Zadek, 2016; Strange et al., 2013). However, the development of the Aiddata methodology, used to collect information on Chinese aid projects, and the subsequent release of Aiddata's Global Development Finance datasets have led to an increase in empirical analysis that put this vision into perspective.

While the focus of the literature was initially put on the various allocation drivers of Chinese development finance (Broich, 2017; Dreher et al. 2018; Dreher et al. 2015; Guillon & Mathonnat, 2020) and its effectiveness on economic outcomes (Dreher et al., 2019; Dreher et al., 2021; Bluhm et al., 2018), crucial indicators of social and human development have remained almost absent of the literature. This recently evolved with a series of papers investigating governance (Isaksson & Kotsadam, 2018; Gehring et al., 2018) and welfare outcomes (Cruzatti et al. 2020; Martorano et al. 2020). Yet, these analysis rely almost exclusively on samples constituted of African countries, except in large cross-countries analysis (Cruzatti et al. 2020). This probably reflects the tremendous development needs of the continent. It is also the result of the concentration in number of Chinese aid projects (Oh, 2019; Dreher et al., 2021). However, figures in terms of project financial size rather than number of projects reveal that Southeast Asia is home to an important share of Chinese projects (Dreher et al., 2021). Indeed, China's global strategy, geo-strategic issues in the region as well as BRI routes explain well the importance of forming strong relationships with neighbor countries.

This study contributes to the literature by providing local evidence of Chinese development finance's effects on a range of human development outcomes: education, health and material living conditions. It contributes to the literature by using geo-referenced project data in an Asian country, Cambodia, and investigates the heterogeneity of Chinese aid effect across different sub-populations. It further builds on innovative methodological papers that developed difference-in-difference models to account for heterogeneity of treatment effects and timing. My first results show that Chinese aid does not impact selected education, health and economic outcomes in the Cambodian context. But looking at results for sub-populations by wealth level show that projects do benefit the health of the poorest population after more than 10 years of exposure.

While these results do not align with those of Martorano et al. (2020) regarding education, they are not surprising in the Cambodian context. There is a low share of total number of projects in education and health, while the vast majority of Chinese development finance is directed toward large infrastructure projects. Those would rather tend to improve economic well-being and reduce travel time and could affect welfare outcomes indirectly. But the low face-value of projects combined to the deteriorated political environment in the country appears to prevent any sizeable effect on education and economic welfare to appear. It could also be that effects appear over the general population after a longer time of exposure than available in this study.

The results of this study suffer from limitations that have already been stated. First,

studies on international aid carry a risk of endogeneity and omitted variable bias, resulting from its non-random allocation. Even though I used efficient approaches to tackle this issue, one can never be certain that the conditional parallel trends truly hold for the periods under scrutiny. Second, data from Aiddata rely on unofficial and incomplete sources. On this question, Horn et al. (2019) believe that around half of Chinese development flows to developing countries remain unaccounted for. Hence, the conclusions of this study might not hold in reality, even though I mitigated this issue by only taking the presence of a project as treatment and not its financial value. It is clear that further analysis on Chinese development flows would largely benefit from disclosed information from China and/or additional information on activities entailed by projects. Finally, there a lot more human development variables that could have been investigated in this study, such as consumption pattern, child mortality or subjective well-being. Heterogeneity of effects should also be investigated further to better understand how projects affect the population. Similarly, future studies should investigate countries other than African countries, whether Asian or Latin American, in order to understand whether results found in the literature for African countries also hold in other geographical locations.

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9 Appendix

Figure 1: Chinese Aid presence in ASEAN countries, in cumulative number of funded-projects from 2000 to 2014.

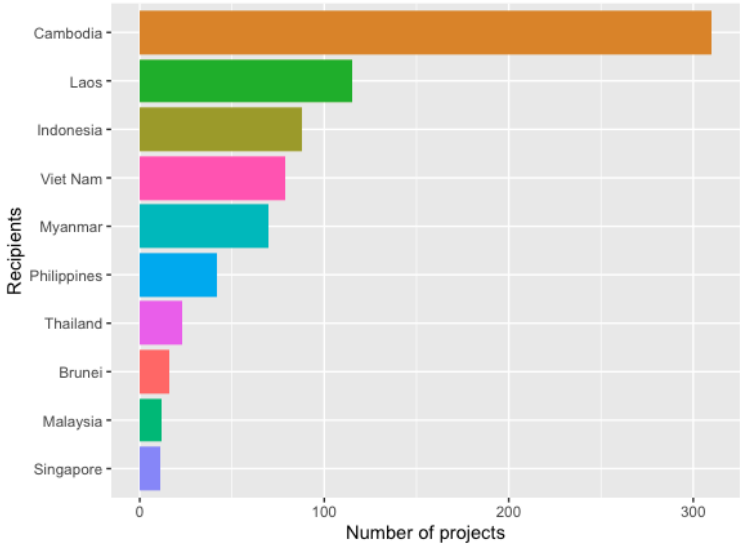

Figure 2: Number of new projects with precision 1 and 2, per year in Cambodia

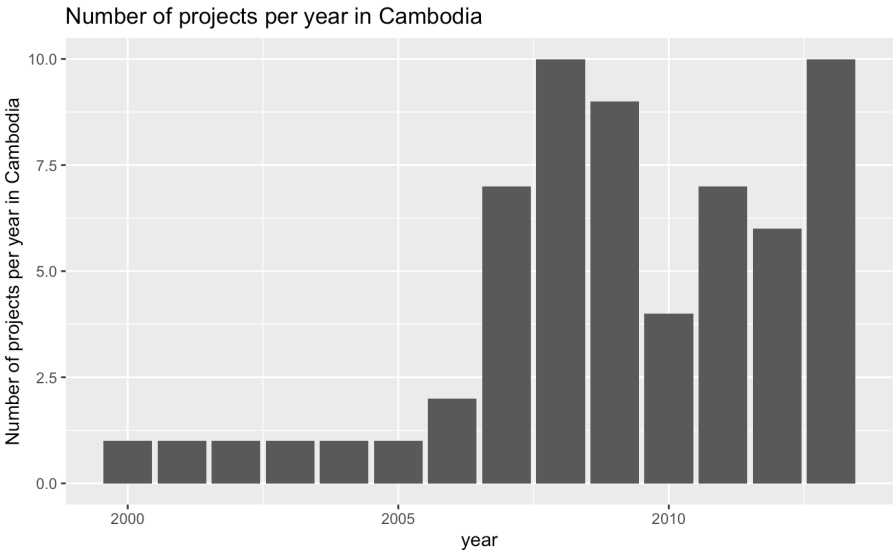

Figure 3: Distribution of projects by aggregated sector and type of financing flows.

Figure 4: Mapping of Chinese Development projects (2000-2014) over population density in Cambodia (2000).

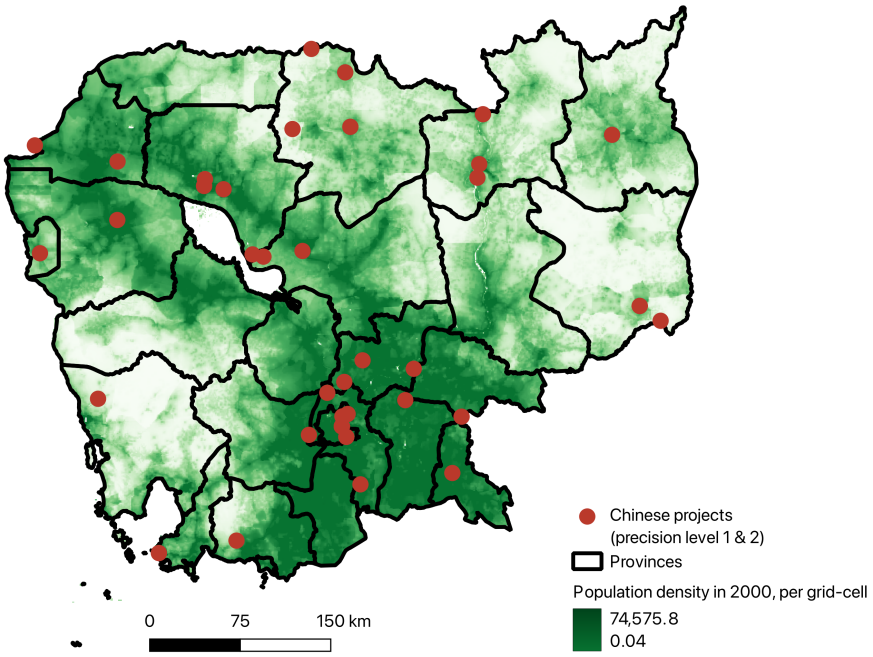

Table 1: Results of a probit model on identified covariates

	(1)
Dependency ratio	-0.0241***
	(-10.13)
Woman head of household	0.0177***
	(4.51)
Rural place of residency	0.0328***
	(7.20)
Population density by quintile (DHS cluster level)	0.0869***
	(44.60)
Access to electricity	0.184***
	(49.54)
Cumulative financial value of WB projects by province	-7.74e-11***
	(-4.79)
Improved floor	0.0555***
	(8.18)
Observations	57506

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Estimation of all ATT(g,t) before aggregation, for the outcome "time to access drinkable water"

	Coef.	Std. Err.	P-value
g2005			
t 2000,2005	-0.96	1.84	0.60
t 2000,2010	0.70	1.58	0.66
t 2000,2015	-1.57	2.70	0.56
g2010			
t 2000,2005	-0.87	1.88	0.64
t 2005,2010	-2.46	1.75	0.16
t 2005,2015	-2.29	2.19	0.29
g2015			
t 2000,2005	-2.04	1.47	0.16
t 2005,2010	1.93	1.68	0.25
t 2010,2015	-1.01	1.78	0.57

Control: not yet treated and never-treated. Number of observations: 54,328

ATT(g,t) estimated before treatment are used to estimate pre-treatment trends.

Table 3: Results of placebo test for treatment zone of 50km

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
Chi2	1.41	1.37	1.82	3.84	0.11
p-value	0.70	0.71	0.61	0.28	0.99
Obs	49,454	34,925	15,690	53,502	55,096

H0: All Pre-treatment are equal to 0

Table 4: Did with reweighting for a treatment zone of 50km

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
Treatment	-0.02	-0.01	9.41	-1.33	0.11
	(0.02)	(0.03)	(9.2)	(1.44)	(0.07)
p-value	0.45	0.67	0.31	0.36	0.15
Obs	49,454	34,925	15,690	53,502	55,096

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Event-study results for a treatment zone of 50km

	(1) GAR prim	(2) GAR sec	(3) Weight for age	(4) Time to water	(5) Wealth index
10 years before treatment	-0.00	0.02	17.05	0.76	0.02
	(0.03)	(0.03)	(14.82)	(1.75)	(0.14)
5 years before treatment	-0.02	0.00	2.94	1.61	-0.02
	(0.02)	(0.03)	(9.26)	(1.42)	(0.08)
0 to 5 years after treatment	-0.01	-0.07**	0.62	-1.45	0.12
	(0.02)	(0.03)	(7.67)	(0.22)	(0.06)
5 to 10 years after treatment	-0.02	0.00	11.37	-0.29	0.08
	(0.04)	(0.04)	(10.56)	(1.32)	(0.08)
10 + years after treatment	-0.02	0.11	26.56	-2.65	0.13
	(0.05)	(0.07)	(21.54)	(4.03)	(0.23)
Observations	49,454	34,92	15,690	53,502	55,096

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$