Chinese Aid, Oil, and Growth

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Abstract

This paper looks to find the effects of Chinese aid on recipient countries growth. In order to account for reverse causality and omitted variable bias problems, I use an instrumental variable that uses variation in recipient countries in the form of oil and variation in time in the form of yearly Chinese steel production. I find that aggregate Chinese aid has positive impacts on GDP per capita with an increase in one million dollars in aid, being associated with $1.33 in GDP per capita in recipient countries, but has no effect on GDP growth rates. When breaking down into the different types of aid (Offical Development Assistance (ODA) and Other Offical Flows (OOF)), I find that Chinese OOF-like aid has positive impacts on GDP per capita, but has no effect on GDP growth rates. For ODA-like aid the results need to be interpreted with caution due to concerns over instrument relevancy. I find that Chinese ODA-like aid has a negative effect on GDP per capita, but the effect on GDP growth rates is positive.

1 Introduction

While foreign aid has traditionally been given from western countries, in the past two decades China has risen as one of the biggest providers of foreign aid. In contrast from the West, much of Chinese foreign aid does not qualify as Official Development Assistance

(ODA) as defined by the OECD. This has lead many to accuse China of being a rogue donor, with concerns that this type of aid will lead to more harm than good for recipient countries. Another issue that is often brought up with China is their lack of transparency, however, AidData has constructed a data set that contains Chinese foreign aid data. This data set will be discussed more in section 2.

The existing foreign aid literature has found mixed impacts of foreign aid. Some have found positive impacts, such as Clemens et al. [2011] which re-analyzes data from 3 published studies on aid. However, some have found aid as having no effect or even having harmful effects. For example, Nunn and Qian [2014] found that U.S food aid can have harmful effects like increasing and lengthening civil conflicts in recipient countries. Therefore, since China is seen as a potential rogue donor, it is necessary to understand the impact that their aid has on recipient countries. To this end, there have been a couple of different analysis of Chinese foreign aid. In Mueller [2021], there is an analysis of Chinese aid on recipient countries growth by exploiting timing and spatial variation of labor unrest in China. Mueller finds that Chinese aid has positive impacts on GDP, consumption and employment. These findings are also supported by Dreher et al. [2017] (which was revised in 2021 [Dreher et al., 2021]), in which they look at the effects of Chinese foreign aid on growth using variation in Chinese steel production following a similar method to Nunn and Qian [2014].

In this paper, I hope to do add to this existing literature by looking at the impacts of foreign aid on recipient countries growth. I will also analyze two different types of aid to understand the difference between the effects of the types of aid. However, there can be potential endogeneity and reverse causality problems because China could potentially give more aid to poorer countries, leading to results that make it look like giving more aid results in worse outcomes. In order to get around this problem, previous papers have focused primarily on factors internal to China while treating the countries that receive aid as black boxes. In this paper, I look to add a perspective that uses recipient countries factors.

Specifically, I will do this by looking at whether or not they have oil. The reason why this would have an impact on Chinese foreign aid is that China uses foreign aid strategically. In a government issued official document in 2014 titled "White Paper on China's Foreign Aid", China explicitly describes their use of aid as being a "win-win" between China and developing countries, emphasizing the use of foreign aid as mutually beneficial. Part of China's strategic aid is making foreign aid deals with countries that have natural resources, particularly countries with oil reserves, thus leading China to target countries with oil that are in need of aid [Dreher, 2018].

In addition to this variation in recipient country, I follow from Dreher et al. [2017] and utilize variations in time from yearly Chinese steel production. By interacting the variations for time and recipient countries, I can construct an instrumental variable to predict Chinese foreign aid. The reason why this should work as an IV is that in years where steel production is high, China will have a steel surplus which they use on aid projects, meaning they will give more money out in aid. The interaction of oil is because China sees oil as a strategic resource, so they will be more likely to give more aid to countries they have oil. This is explored more in section 3.

This paper is structured as followed: In section 2, I discuss the data from which I created a panel data set including the Chinese foreign aid data from AidData. Section 3 covers the IV strategy, section 4 discusses the findings from this strategy, and then section 5 concludes.

2 Data

This paper utilizes 4 different data sets; the first that I will discuss is the AidData's Global Chinese Development Finance Dataset, Version 2.0, which I will refer to as AidData

[Custer et al, 2021]. This data set captures 13,427 projects worth $843 Billion across 165 countries from 2000 to 2017. Since China does not officially report their foreign aid, this data set was created using the Tracking Underreported Financial Flows (TUFF) methodology, which tracks foreign aid by synthesizing and standardizing data from a variety of sources. This data set contains information as to whether a certain aid project is "ODA-like", "OOF-Like" or "Vague Official Finance (OF)". ODA stands for Offical Development Assitance, and ODA-Like projects are projects that promote economic or social development and are consistent with the ODA criteria established by the OECD-DAC. These projects are more concessional in nature, meaning they don't make strict requirements and are related to things such as education and emergency response. This type of aid makes up around 12% of total Chinese aid, but is often made up of numerous projects. OOF stands for Other Official Flows and are types of aid that do not meet ODA requirements. This type of aid is ODA generally less concessional and more commericially oriented with general projects relating to energy, infrastructure, and industry. This category of projects is by far the largest in terms of dollar amount, taking up over 80% of the Chinese foreign aid. The last category "Vague Official Finance (OF)" are projects where there is not sufficient data to determine if it is ODA-like or OOF-like, but this is the smallest category percentage wise making up a little of 7% of total Chinese aid. In order to utilize this data, I added together the total amount of money, measured in millions of dollars of 2017 dollars, of each project in a given country and year in order to get an aggregate level of aid. I also did likewise with the ODA-like and OOF-like aid in order to explore these further.

This data set does have some limitations. The main problem is that there are missing financial records for some of the projects. Although, Dreher et al. [2017] calls this a secondary problem for looking at the aggregate effect of aid on outcomes because most of the missing projects are technical assistance and scholarships, which tend to be small scale flows. Since I am focusing on aid in amount of money and not number of aid projects, then this is a

relatively minor deal for my analysis.

The second data set I used was the World Bank data for GDP per capita (measured in 2017 dollars) and GDP growth (annual %) of recipient countries from 2000 to 2017 to measure as outcomes[WorldBank, 2021]. The third data set is the World Steel Association's data on yearly Chinese steel production from 2000 to 2017 which is measured in thousands of metric tons[WSA, 2021]. The fourth data set was the 2021 BP Statistical Review of World energy which contains data on countries oil reserves[BP, 2021]. I created a binary variable that was 1 if a country had oil, and 0 otherwise. The summary statistics of all the relevant variables are in Table 2.1.

Table 2.1: Summary Statistics

	Mean	SD	Min	Max	N
gdppercap (2017 $)	9,622.23	9,360.38	630.70	71,843.52	2,284.00
gdpgrow (%)	4.26	5.88	-62.08	123.14	2,360.00
aid (Millions 2017 $)	341.09	1,603.38	0.00	36,037.02	2,466.00
odaaid (M 2017 $)	40.49	216.00	0.00	8,097.84	2,466.00
oofaid (M 2017 $)	276.33	1,545.13	0.00	36,037.02	2,466.00
vofaid (M 2017 $)	24.28	204.51	0.00	4,336.04	2,466.00
population	31,943,460.49	108821641.50	9,827.00	1338676779.00	2,442.00
oil	0.26	0.44	0.00	1.00	2,466.00
steel (1k MT)	528,007.67	252,504.88	128,500.00	870,855.00	2,466.00

3 Empirical Strategy

For our empirical strategy, we look at the following regression:

$$Growth_{j,t} = \beta_1 Aid_{j,t-2} + \beta_2 lpop_{j,t-1} + \alpha_j + \alpha_t + \epsilon_{j,t}$$

where $Growth_{j,t}$ is country j's GDP per capita or annual GDP growth in year t; $Aid_{j,t-2}$ is

the amount of committed financial aid to country j, year $t-2$ (lagged two years); $lpop_{j,t}$ is logged population of country j in time $t-1$ (lagged one year); and α_j and α_t are country and time fixed effects, respectively, and $\varepsilon_{j,t}$ is the error term. The reason for having aid be lagged is that aid is the amount of *committed* financial aid in a given year, so aid will be given following the announcement of the projects and effects of the aid will reasonably start to be seen in the years following. The reason I am not using aid per capita or aid over GDP is that Annen and Kosempel [2019] point out that there is no obvious theoretical reason for doing it this way, and they found a downward bias in aid over GDP ratios. Instead, I will follow as Dreher et al. [2017] and include logged population as a control.

Chinese aid is likely to have reverse causality problems due potentially wanting to China giving aid to countries based on economic conditions. There could also be omitted variable bias because perhaps China gives more to countries with worse institutions, and since worse institutions have a negative effect on growth, then there would be a downward bias. In order to get around this, I use an instrumental variable strategy with the following first stage regression:

$$Aid_{j,t-2} = \gamma_1 Steel_{t-3} \cdot Oil_j + \gamma_2 lpop_{j,t-1} + \alpha_j + \alpha_t + \nu_{j,t}$$

where $Steel_t$ is Chinese steel production in year $t-3$ (lagged 3 years) and Oil_j is a binary variable that is 1 when a country j has oil reserves and 0 if not, and $\nu_{j,t}$ is the error term. The remaining variables are the same as defined previously. Lagging the steel variable is because China would reasonably look at their previous year steel production to see how much surplus steel they have to decide how many and how big of aid projects they want to give. For the rest of the paper, I define $iv_{j,t-3} := Steel_{t-3} \cdot Oil_j$ for ease of reading and writing.

$iv_{j,t-3}$ should work as an IV because of the following reason: When China has a large production of steel, they will have excess steel in their reserves. China uses steel in their aid

projects, so when excess steel is high, they will give more aid. The interaction with Oil_j is because China sees oil as a strategic resource and since China uses aid strategically, they will give more aid to countries with oil. This IV approach is similar to a difference in difference because it looks at the differential effect of a country having oil or not.

I argue that the interaction between $Steel_t \cdot Oil_j$ does not violate conditional independence assumption because the distribution of oil reserves should be essentially random and after controlling for time fixed effects, Chinese steel production should be random as well. For the exclusion restriction, Chinese steel production should be internal to Chinese growth and should not effect other countries growth except through Chinese foreign aid. Oil reserves, however, do violate the exclusion restriction [Lashitew and Werker, 2020]. Oil can effect a countries growth in two ways: a direct way, by oil generating economic rents that can be used to help the country grow. The indirect effect of oil is how it can potentially negatively effect the institutions of the countries, such as through revenues from oil being used for political control. This means that the direct channel has positive effects on economic development, while the indirect effect has negative effects on economic development, leaving us with oil having an ambiguous effect on development overall without knowing the magnitudes of the effects. The point of this paper is not to understand the impacts of oil directly, so I will proceed understanding that my IV is imperfect.

4 Results

I will first look at the results on aggregate aid and then will look more closely at ODA-like and OOF-like aid.

4.1 Basic OLS (Aggregate Aid)

First I look at the basic OLS regressions as shown in table 4.1 using $aid_{j,t-2}$ as our independent variable and GDP growth and GDP per capita as dependent variables.I find that both with and without the set of fixed effects, aid has no effect on GDP growth. In columns 3 and 4, aid has statistically significant positive effects on GDP per capita. The magnitudes however are very small, with the results showing that a one million dollar increase in aid to a country is associated with only about 9 cents increase in GDP per capita. However, these results are very likely biased or have reverse causality or omitted variable bias. Therefore, we move on to our regressions using our IV.

Table 4.1: OLS Regression

	GDP Growth(%)		(GDP per Capita)	
	(1)	(2)	(3)	(4)
aid (t-2) ($ M)	0.0000	0.0000	0.4394***	0.0850***
	(0.0001)	(0.0001)	(0.1491)	(0.0263)
lpop (t-1)		-0.8606		-9398.4114***
		(2.2411)		(574.7359)
_cons	4.3016***	22.4783	9719.5284***	159890.5715***
	(0.1314)	(38.5749)	(212.3299)	(9795.6199)
N	2104	2104	2035	2035
Fixed Effects	No	Yes	No	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

4.2 2SLS IV Regression (Aggregate Aid)

First, I need to check that our instrument is actually relevant on aid, so I look at the first stage of the 2SLS (table 4.2).The instrumental variable is statistically significant and we find that a 1000 MT increase in Chinese steel production is associated with a $1600 increase foreign aid to countries with oil, so the magnitudes are reasonably large. We find that our

overall instrument is relevant with an F-statistic of 2.77 (prob > F = 0.000), although this F-statistic is not as large as hoped for.

Table 4.2: First Stage

	aid(t-2) (Millions)	
	(1)	(2)
iv (t-3)	0.0016***	0.0016***
	(0.0003)	(0.0004)
lpop (t-1)		-982.3031
		(617.7293)
_cons	120.3741***	16692.9523
	(15.1100)	(10560.2638)
N	2044	2034
F-stat	28.135	2.774
Fixed Effects	No	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

Table 4.3: Second Stage

	GDP Growth(%)	(GDP per Capita)
	(1)	(2)
aid(t-2) ($M)	-0.0001	1.3255***
	(0.0002)	(0.2816)
_cons	4.4154***	9583.4830***
	(0.1428)	(232.2618)
N	1974	1909
Fixed Effects	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

Now, I analyze the actual results in second stage (table 4.3). I find that using this IV, that the effect of aid on annual growth of GDP is negative, but statistically insignificant like what was found in the OLS. However, the effect of aid is much larger on GDP per capita than in the OLS, with a one million dollar increase in aid being associated with a $1.33

increase in GDP per capita. These findings are pretty substantial because this is a fairly large increase in GDP per capita for only a million dollars. These findings suggest that Chinese aid has positive effects in the short term on GDP.

4.3 ODA and OOF Aid

Now, I look at the effects of aid, except I restrict aid to be ODA-like or OOF-like. This allows me to look more closely at the effects of the different type of aid. First, starting with the base OLS estimates (table 4.4).

Table 4.4: ODA/OOF-like Aid OLS

	GDP Growth(%)		(GDP per Capita)	
	(1)	(2)	(3)	(4)
odaaid(t-2) ($ M)	0.001**		0.089	
	(0.001)		(0.152)	
lpop(t-1)	-1.005	-0.864	-9455.577***	-9379.025***
	(2.239)	(2.242)	(576.331)	(575.174)
oofaid(t-2) ($ M)		0.000		0.082***
		(0.000)		(0.027)
_cons	24.856	22.546	160845.910***	159557.479***
	(38.540)	(38.589)	(9823.010)	(9803.020)
N	2104	2104	2035	2035
Fixed Effects	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

I find that ODA-like aid has a significant effect at the 10% level on GDP growth, with a one million dollar increase in aid being associated with a 0.001% increase in GDP growth, which is pretty substantial. For OOF-like aid, we find that there is no impact on GDP growth. For GDP per capita, we find that ODA-like aid is statistically insignificant, but actually has a slightly larger magnitude than OOF-like aid, which is statistically significant. Both can be interpreted as a one million dollar increase in respective aid type is associated

with 8-9 cents in GDP per capita.

Again, these OLS estimates are likely biased, so I will use 2SLS with my IV. I begin by looking at the first stage of our 2SLS to see the relevancy of the instrument (table 4.5).

Table 4.5: ODA/OOF-like Aid First Stage

	odaaid ($ M)	oofaid ($ M)
	(1)	(2)
iv(t-3)	-0.0000	0.0015***
	(0.0000)	(0.0004)
lpop(t-1)	86.7057**	-1168.1332*
	(43.7415)	(614.8262)
_cons	-1469.9128*	20170.0066*
	(754.6800)	(10568.7093)
N	2035	2035
F-stat	3.189	1.866
Fixed Effects	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

For ODA-like aid, the effect of $iv_{j,t-3}$ is statistically insignificant on aid. This is likely because countries that have oil are receiving their aid primarily through OOF-like aid as opposed to ODA-like aid. This means there needs to be caution when interpreting any results in the second stage. For OOF-like aid, $iv_{j,t-3}$ is statistically significant with a 1000 MT increase in steel production being associated with with $15,000 increase in aid for countries with oil. The F-statistic is only 1.866 which is not as big as hoped for, but (prob $>$ F $=$ 0.000), so the instrument is relevant.

Now, we move onto the results of our IV in the second stage (table 4.6). The results show that for ODA-like aid, GDP Growth is statistically significant with a positive effect, with a one million dollar increase in ODA aid being associated with a 0.0061 % increase in GDP growth. The effect on GDP per capita is statistically significant with a very large negative effect, with an increase in one million dollars in ODA aid associated with $ -24.43

in GDP per capita. This result needs to be interpreted with caution because of the problems with the instrument. For OOF-like aid there is a negative effect on GDP growth, but the magnitude is small so it is statistically insignificant. OOF-like aid does have a large effect on GDP per capita, with a one million dollar increase in OOF-aid being associated with a $1.78 increase in GDP per capita.

Table 4.6: ODA/OOF-like Aid Second Stage

	GDP Growth(%)		(GDP per Capita)	
	(1)	(2)	(3)	(4)
odaaid2	0.0061***		-24.4325***	
	(0.0017)		(3.0474)	
oofaid2		-0.0002		1.7755***
		(0.0002)		(0.2967)
_cons	4.1429***	4.4246***	10897.9163***	9552.0661***
	(0.1503)	(0.1407)	(269.8163)	(229.6437)
N	1974	1974	1909	1909
Fixed Effects	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10.

5 Conclusion

I find that for aggregate aid, Chinese foreign aid has positive effects for GDP per capita, but has no effect on GDP growth. When breaking it down into the different type of aid given, we find that OOF-like has no effect on growth and a large positive effect on GDP per capita. We find that ODA-like aid has a positive effect on annual GDP growth rates and a negative effect on GDP per capita, but these results come from an instrument with problems with relevance. However, ODA-like aid only makes up a small portion of Chinese foreign aid, so a large amount of the aid is accounted for by the results for OOF-like aid.

Another word of caution about these results are that the IV violates exclusion restriction because of the effects of having oil on a countries GDP and growth. If the effects of oil are minimal and thus do not severely violate the exclusion restriction, then these findings suggest that Chinese aid has positive impacts on short run GDP for recipient countries.

Overall, I find that Chinese aid appears to beneficial to recipient countries, suggesting that the West does not need to be concerned about China as a rogue donor. However, this paper is lacking an explanation as to why ODA-like aid has positive effects for GDP growth but a negative effect for GDP per capita, so there needs to be a better analysis of this type of aid.

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