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Is China's Aid Good or Bad for Economic Development in African countries?

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Creative component

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I. Introduction

The Official Development Assistance (ODA), as defined by the Development Assistance Committee of the Organization of Economic Cooperation and Development (OECD DAC), is foreign aid that aims for the economic development and welfare of developing countries. There are two major agents involved in the distribution of aid. One is a donor group consisting of rich countries that provide aid, and the other is a recipient group consisting of poor countries that need aid. In the past, from 1950 to 2005, there used to be a competition in the recipient group to get more aid due to the chronic poverty and pandemic disease hampering economic growth in most of the poor countries. On the other hand, since 2005, we face a new phenomenon of competition in the donor group to provide more aid to the recipient counties as China rapidly increased its aid, and the recipient group has more choices from whom to receive aid as a result.

Why do the donors compete to provide aid? One reason is that donors can achieve different types of economic and political benefits by offering aid. Fuchs et al. (2013) argued that aid is provided based on the donor's incentive. For example, from the donor's perspective, aid can provide more access to natural resources located in the recipient country or influence political support in the voting system of the United Nations. This study will have a closer look at China's aid comparing it to one of the traditional donors: the US.

The United States has been a top donor and a dominant power in Africa. According to USAID, the US provided 46 billion USD as foreign aid worldwide in 2018 and spent 12 billion USD of this in Africa, focusing on emergency response, HIV/AIDS, health, and

education.[1] However, after the US 2008 mortgage crisis, the US switched its priority of budget allocation, focusing more on domestic issues at the expense of international ones. As a result, US aid to Africa rapidly decreased for a period after 2008; and although it has subsequently increased, it could have been much higher had the increasing trend of aid before 2008 been maintained.

On the other hand, according to Brautigam (2011), China increased its aid significantly since 2006 and became a rising donor in Africa. The key difference of China's aid is that its aid allocation seems to be more strategically targeted on natural resources and raw materials, unlike the US. Moreover, the current situation in Africa is that the recipient countries welcome Chinese aid money as a new source of finance for their economic development, while traditional donors—rich countries having a long history of offering aid—have been suffering from economic depression and debt crisis. As a result of China's aid, African countries have been prompted to offer trade and market benefits to China in return.

[1] USAID (2020). https://explorer.usaid.gov/

II. Literature

The unprecedented and different aid activity of China as a new donor brings debate in the international society on whether it has a positive or negative impact on African countries' economic growth. Some observers criticize that the behavior of Chinese aid is motivated by China's economic benefits and market expansion. Dreher et al. (2018) argue that Chinese economic incentives explain its aid allocation better than political incentives. Shinn (2019) insists that the import of inexpensive Chinese products is preferable to African consumers than similar local goods, making local producers lose their competitiveness in the domestic market.

On the other hand, others consider China’s aid as a new chance for Africa. Shinn (2019) suggests that China’s aid can increase the utility of African consumers by offering more choice of goods at lower prices. Also, Woods (2008) views China's aid as a new source of development finance. Brautigam (2011) provides a qualitative analysis of China’s aid in her book and insists that China's aid has a unique feature of cost-efficiency. Since China's aid is offered as a type of tied aid, the aid is combined with trade and investment like a package. For instance, China offers aid to build a road to the mining site and have a priority contract to import rare ore from the local mine. So, the aid works as a booster to promote trade in this case.

There is also a suspicion on which sector China mainly provides its aid. Dreher and Fuchs (2016) suspect that China is strategically targeting natural resources and raw materials but concludes that their doubts are unjustified yet. Hilson et al. (2014) capture the increasing

trend of the Chinese population in the African mining sector as evidence of the increasing amount of Chinese aid. It is because Chinese aid brings Chinese labor as a tied package with infrastructural projects to the developed mining site.

Despite ongoing debates, suspicions, and worries about the effect of China's aid, little research has been done to measure the aggregated impact on African countries. Thus, this study aims to reveal whether China's aid is good or bad for economic development in poor African countries from the recipient's perspective. In order to answer the main research question, the study will investigate three sub-questions as following:

1) How much aid does China offer Africa?
    - To what extent has Chinese financial inflows to Africa been growing?
    - How significant is the ratio of China's aid comparing to that of western countries' in Africa?

2) How is China's aid different from OECD assistance in Africa?
    - Infrastructure, trade, agriculture
    - Aid mixed with trade and investment (concessional)
    - No condition on governance or domestic politics

3) What is the impact of China's aid in Africa?
    - Is it beneficial or detrimental to African countries' GDP growth?

III. How much aid does China offer Africa?

China's aid has been significantly growing for the last two decades, as shown in Figure 1. According to the foreign aid data officially announced by the Ministry of Finance in China, it offered only 631 million USD in 2003. By 2018 this had increased to 3,277 million USD, which is more than 500% growth.[2] If China had not suffered from a stock market crash in 2016, it could have been even higher.

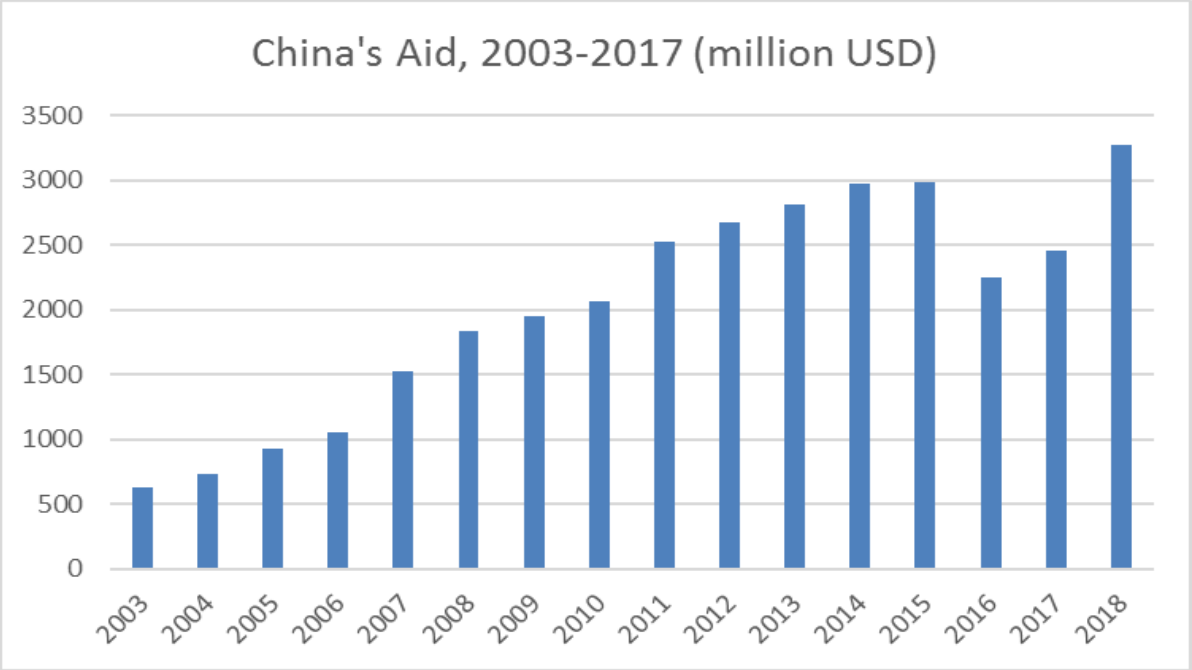

Figure 1.China's aid (official) to the world, 2003-2017

Source: China Africa Research Initiative (2020). Johns Hopkins University

[2] China Africa Research Initiative (2020). Johns Hopkins University

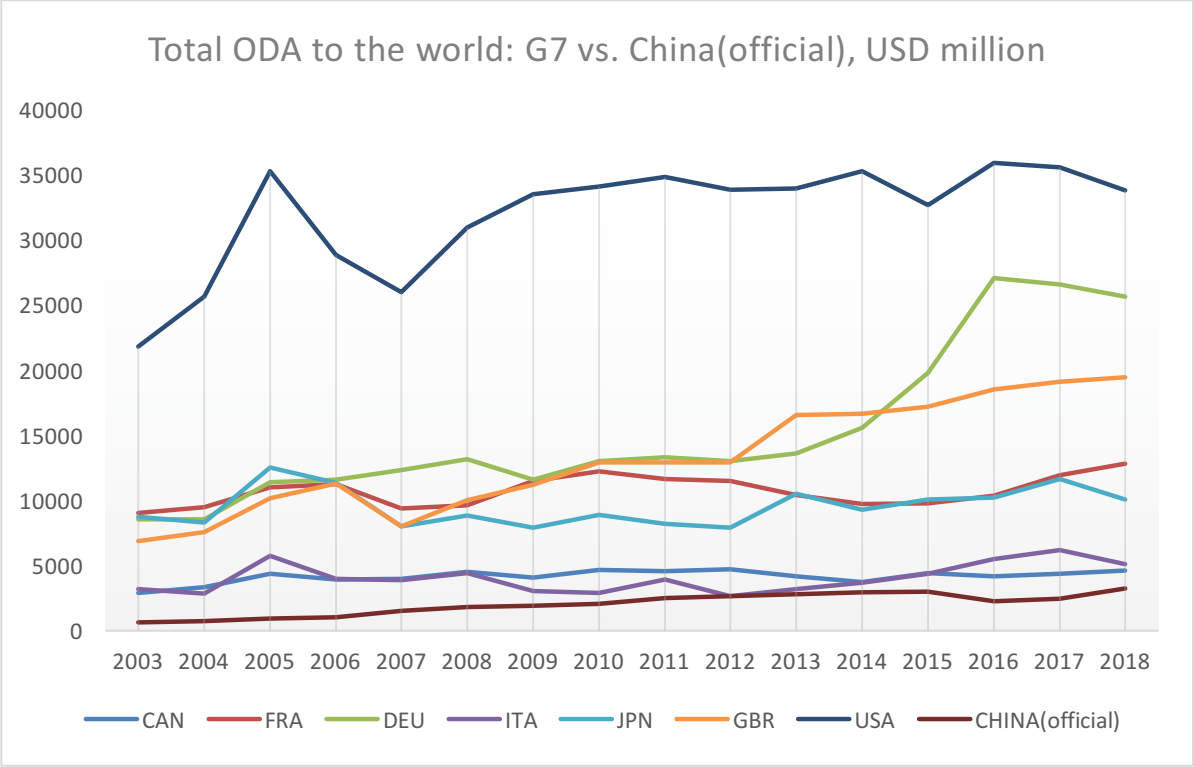

Figure 2. Total ODA to the world: G7 donors vs. China (official) 2003-2018

Source: OECD library statistics (2020).

Figure 2 above shows the significant increase of China's total foreign aid to the world, compared to that of G7 donors, Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. These are generally the top donors and have political power in the United Nations. They are also core members of the OECD DAC donor club.[3] The blue line on the top shows the US as a leading donor. Approximately 26% of the US aid in 2017 goes to Africa.[4] There are two downturns of the US aid due to the mortgage crisis in 2008 and "mini-recession" from slowing down the business investment between

[3] OECD DAC donor member countries: Australia, Austria, Belgium, Canada, Denmark, the European Union, Finland, France, Germany, Greece, Ireland, Italy, Japan, South Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

[4] USAID (2020).

2015 and 2016. [5] Although it recovered to the original level, considering the rapidly increasing trend until 2005, it could have been higher if the US had not struggled with domestic financial issues. The red line at the bottom is China's aid, officially announced by the Chinese government. Comparing to the US aid 35,578 million USD[6] in 2017, China's aid was 2,451.5 million USD[7] in 2017, which is only about one-fourteenth of the US aid.

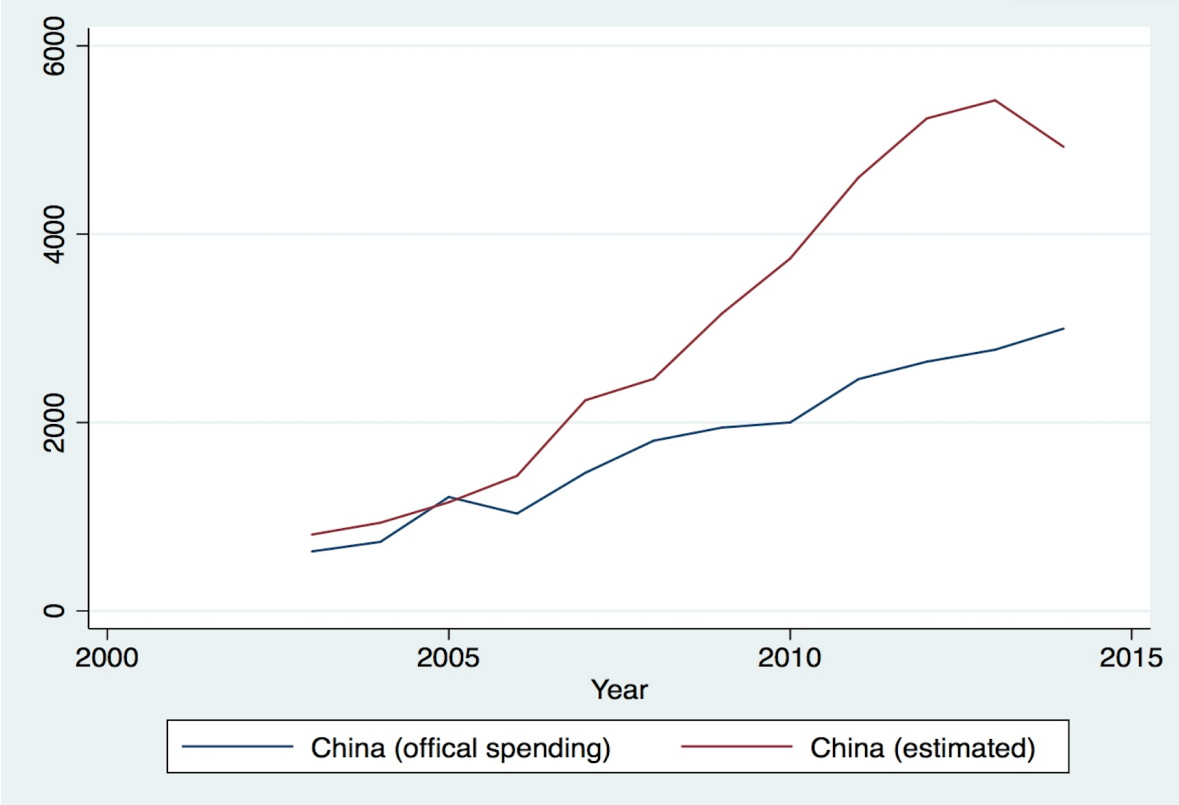

Figure 3.China's aid: estimated (in Africa only) vs. official (to the world) (million, USD)

Source: Aid Data (2020). William and Mary's research lab

[5] https://www.nytimes.com/2018/09/29/upshot/mini-recession-2016-little-known-big-impact.html
[6] USAID (2020).
[7] China Africa Research Initiative (2020).

However, there have been many suspicions from the G7 donors that China's official aid seems much smaller than what China actually provides, and it seems that China intentionally could have reported a false amount of aid to disguise its strategy of foreign policy. It is a plausible scenario because China is not an OECD DAC member, so China is not required to report official bilateral aid data to any international organization. On the other hand, G7 countries, including the United States, are required to report all of their aid data to the OECD DAC committee and have a peer review once in four to five years as a member of the donor club.

Figure 3 above compares the estimated amount of China's aid to African countries with the officially reported figures and documents a significant gap relative to the amount announced by the Chinese government. The official aid data is based on the disbursement that the Chinese government actually transferred to the recipient government. On the other hand, the estimated aid data has been collected in the field, based on the committed project size and duration from 2003 to 2014. For example, if there is road construction, an interviewer goes to the construction site and ask the workers how big the project size is, how long the construction will go on, and how much they are paid daily, and calculates the total estimated amount of project aided. This means that estimated aid data is based on the amount that China committed until the project ends, which is different from what has been spent yet. Therefore, this gap might come from the discrepancy between the commitment and disbursement of China's aid because the Chinese government can commit the aid budget based on a 5-year or 10-year period and spend annually. For reference, OECD donor reports both commitment and disbursement every year so that other countries can track

each other's aid behaviors. In Figure 3, especially in 2013, it showed the most significant gap that estimated China's aid amount is 5,421 million USD, while the official data is 2,773 million USD, which is almost two times.

Since China does not report its aid data to international society, no one knows exactly how much China spends its aid to Africa. Due to the unavailability of official data and no clue except this estimated data, this study will use estimated China's aid data to track China's aid behavior. It will allow the study to estimate the impact of eventual aid inflows into the African continent from China, predict their impact, and evaluate whether they can bring a change in the current aid scheme in the view of recipients as well as donors.

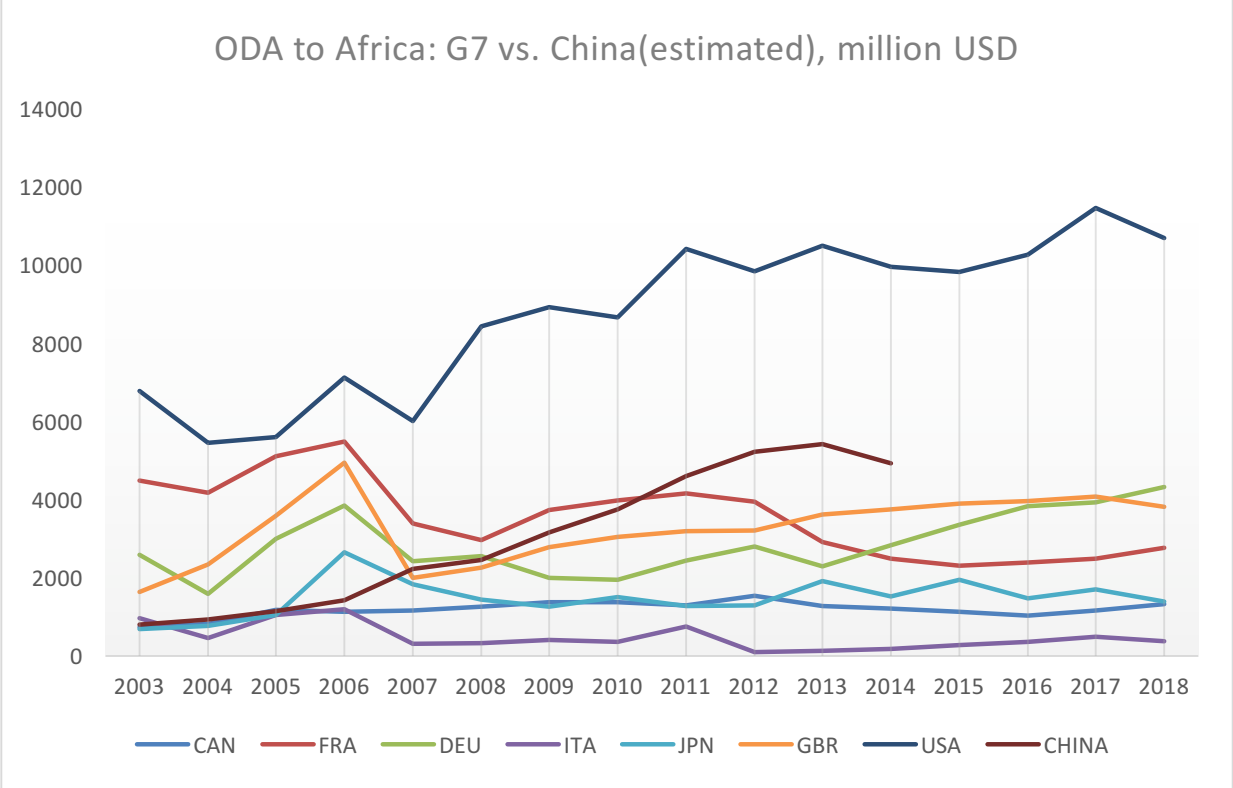

Figure 4.Aid to Africa: G7 vs. China (estimated), million USD

Source: Aid data (2020) for China's aid and OECD library statistics (2020) for G7 countries

Figure 4 shows how much China offers estimated aid to Africa compared to G7 donor countries. In the year 2013, the US provided 10,491 million USD to Africa,[8] while China provided 5,421 million USD.[9] China's aid was approximately one-half of the US aid in 2013 while it was one-eighth in 2003. Moreover, after 2011, China's aid is more than that every G7 country except the US, which are OECD DAC member countries as well as strong and influential donors in the field. The study notes that China's aid data could be overestimated because it is based on project commitment, while G7 countries are based on annual disbursement. However, Figure 4 clearly describes the rapidly increasing trend of China's aid and significant increase over the last twenty years. Even if we cut down the estimation by one-fifth as assuming that all projects are five-year term projects to complete, China still provides significant amount of aid more than two or more of G7 countries.

Major donor countries might want to reconsider the reasons to be bound as a DAC committee under its common regulations, while non-DAC donors can provide smaller amounts of aid and do business independently with the recipients. The reason that traditional donor countries such as G7 establish DAC donor's club is to increase their collective power over the recipient countries.[10] However, China breaks this collective power by providing bilateral aid to African countries as a non-DAC member and taking a favorable economic position.

[8] OECD library stat (2020).
[9] Aid Data (2020).
[10] OECD (2009). https://www.oecd.org/dac/peer-reviews/35051857.pdf

IV. How is China's aid different in Africa?

Traditional donors, the OECD DAC, including the US, mostly offer their aid on the human capital-building sector such as health, education, HIV/AIDS, malaria, humanitarian aid, etc.[11] Unlike traditional donors, China spends aid targeting the sectors of building infrastructure, promoting trade, and agriculture to import raw materials directly related to the donor's economic incentives.[12] Also, China's aid is tied to trade and investment such as a concessional loan that needs to be paid back, although the interest is very low. According to the International Monetary Fund (IMF), a concessional loan is defined as a loan with either low interest rates below market interest rate or with long grace periods.[13] Regardless of this pay-back condition which is not imposed on traditional donor's aid, African countries welcome China's aid because there is no condition on governance of domestic politics. Since African countries had already suffered from severe economic structural adjustment implemented by World Bank or conditioning on good governance such as democracy guaranteeing periodical election which was imposed by traditional donors, they prefer using Chinese government loans without any political conditions but aided by lower interest rates. Again, China's aid works like a booster for a national loan in this case.

Although there is a freedom for African countries to enjoy by accepting China's aid, it does not guarantee whether it can have a positive impact on African GDP. To better understand

[11] USAID (2020).
[12] Brautigam (2011).
[13] https://www.imf.org/external/pubs/ft/eds/Eng/Guide/index.htm

how China's aid affects African economies, this study will analyze the relationship between African countries' GDP and the aid received from China.

V. What is the impact of China's aid in Africa?

1. Data

The study will use a panel data set consisting of annual GDP of each African country and annual aid received from China. The data period is from 2003 to 2014 when estimated bilateral aid data was available between China and African countries. The data unit is USD per year, and data sources are from the Chinese government official data, OECD library data, WTO trade volume, and UNCTAD trade data.

2. Model

The study starts with a standard ordinary least squares (OLS) method with a fixed effect for each country as a baseline estimation of the association between China's aid and African countries' GDP. The fixed effects method is used in order to capture the impact of aid on GDP among African countries rather than the impact coming from the fixed variables such as landlocked position or whether or not a country has mineral deposits. By using a fixed effects regression, the previous studies (Novignon et al., 2012; Fayissa et al., 2008; Ndikumana, 2000) were able to handle the unobserved time-invariant heterogeneity among the countries potentially correlated with the dependent variables. In the model

equation (1) below, the dependent variables are each African countries' GDP, and key independent variables are China's aid, market openness index which is the sum of country *i*'s export and import divided by its GDP at year *t,* and G7 countries' aid. It also has two intercepts to represent country fixed effects α_i as an unobserved country-fixed effect which are invariant over time, and η_t is an unobserved time-fixed effect during the same year, where *i* represents a country and *t* represents a year.

$$GDP_{it} = \alpha_i + \beta_1 C\_AID_{it} + \beta_2 (X + M)_{it}/GDP_{it} + \beta_3 G7\_AID_{it} + \eta_t + \varepsilon_{it} \quad (1)$$

- GDP_{it} is a measure of GDP (current USD) in a country *i* at time *t*
- AID_{it} is a measure of China's aid (current USD) to country *i* at time *t*
- $(X + M)_{it}/GDP_{it}$ is an openness index of a country *i* at time *t* with world
- α_i is an unobserved country-fixed effect
- η_t is an unobserved time-fixed effect
- ε_{it} is an i.i.d. error term

3. Instrumental variable

One potential problem with this approach is that the OLS or the fixed effects analysis with panel data can be biased due to endogeneity if a correlation exists between the independent variable and error term (Wooldridge, 2002). In this study, it is possible that the amount of Chinese aid is affected by the size of the recipient countries' economies. Thus, for the main

analysis, the study will also consider an instrumental variable (IV) estimation with fixed effects to handle the bias from endogeneity.

A valid instrumental variable must be correlated with the explanatory variable but uncorrelated with the error term in the regression. To construct an appropriate instrument, this study starts with China's aid to country *i* in 2006 and projects change from this base year using the growth of total China's aid between 2006 and year *t*. In other words:

$$IV1 = Aid_{i,2006} * \frac{Aid_{CHN_t}}{Aid_{CHN_{2006}}} \quad (2)$$

First stage:

$$C\_AID_{it} = \beta * IV1_{it} + \varepsilon_{it} \quad (3)$$

The logic to set up is, if China increases its aid in year *t* comparing to 2006, then the country *i* receives more aid, which is proportional to what country *i* received in 2006. The study chooses the base year as 2006 because China officially announced the plan for a rapid increase of its aid toward Africa through its white paper of foreign policy. Additionally, since not all the countries received China's aid from 2003, twenty-one out of twenty-four African countries received China's aid in the year 2006 at least, so it was able to minimize the number of losing observations.

As an alternative, this study uses a second IV:

$$IV2 = Aid_{i,2006} * \frac{GDP_{CHN_t}}{GDP_{CHN_{2006}}} \quad (4)$$

IV(2) uses the amount of China's aid that African country *i* received in 2006 multiplying with the ratio of Chinese GDP in year *t* based Chinese GDP in 2006. Depending on the change of China GDP based on that of 2006, then the amount of aid that the country *i* receives is either positively or negatively proportional to what country *i* received in 2006. The study takes the same reason for choosing 2006 as a base year. The study notes that, in the second stage regression, it drops the observations from 2003 to 2006 since it takes 2006 as the base year for using IV(1) and IV(2).

4. Result

Table 1 shows the results from OLS with random effect and OLS with fixed effects models of the relation between China's aid and African countries' GDP. The OLS estimator of model 1 is 5.604 and statistically significant at 90% confidence level. The coefficient size of OLS with the fixed effect of model 2 is similar to that of model 1 but is marginally less significant.

Likewise, Table 2 shows the association between China's aid with lagged period and African GDP. Difference from Table 1, the OLS estimator with the random effect of model 1 and the OLS estimator with fixed effects of model 2 illustrates 7.091 and 6.947 respectively. Also both are statistically significant with slightly larger magnitudes than Table 1. This can suggest that aid takes time to be converted in the form of GDP.

Table 1. Models of China's aid(t) and African GDP(t).

VARIABLES	(1) OLS AF_GDP	(2) FE AF_GDP
C_aid_bilateral	5.604*	5.403
	(3.359)	(3.379)
EM_AFGDP	4.479e+10	4.914e+10
	(4.182e+10)	(4.297e+10)
G7_aid	8.997	8.419
	(5.763)	(5.836)
D3_mkt_openness		
D4_political_conflict		
Constant	2.854e+10*	2.858e+10***
	(1.724e+10)	(4.588e+09)
Observations	192	192
R-squared		0.044
Number of country	24	24

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Models of China's aid(t-1) and African GDP(t)

VARIABLES	(1) OLS FWD1_AFGDP	(2) FE FWD1_AFGDP
C_aid_bilateral	7.091**	6.947**
	(2.947)	(2.963)
EM_AFGDP	3.013e+10	3.290e+10
	(3.694e+10)	(3.768e+10)
G7_aid	8.580*	8.154
	(5.067)	(5.117)
D3_mkt_openness		
D4_polilitcal_conflict		
Constant	3.213e+10*	3.219e+10***
	(1.827e+10)	(4.023e+09)
Observations	192	192
R-squared		0.063
Number of country	24	24

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. The first stage regression of IV estimation

VARIABLES	(1) OLS C_aid	(2) FE C_aid	(3) OLS C_aid	(4) FE C_aid
IV1	0.319***	0.456***		
	(0.0566)	(0.118)		
IV2			0.537***	1.008***
			(0.105)	(0.317)
EM_AFGDP	-4.277e+08	-2.947e+08	-3.313e+08	-2.179e+08
	(5.609e+08)	(9.680e+08)	(5.668e+08)	(9.849e+08)
G7_aid	0.268***	0.251*	0.283***	0.267**
	(0.0946)	(0.128)	(0.0953)	(0.129)
Constant	3.691e+07	-4.767e+07	2.847e+07	-1.379e+08
	(8.298e+07)	(1.120e+08)	(8.372e+07)	(1.349e+08)
Observations	192	192	192	192
R-squared		0.115		0.090
Number of country	24	24	24	24

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 shows the results of the first stage regression of the IV test. This stage examines whether the IVs have statistically significant correlations with China's aid or not. The result explains that both IV(1) and IV(2) have strong correlations with China's aid. Specifically, the correlation between IV(1) and China's aid is 0.319 in the OLS model and 0.456 in the fixed effects model. IV(2) shows a stronger correlation than IV(1) as 0.537 with the OLS model and 1.008 with fixed effect models, respectively. Having such a high correlation of 1.008 in column (4) comes from adding 1 dollar to China's aid for each African country to avoid having zero value in the denominator when formulating instrumental variables.

Table 4. The second stage regression of IV estimation

VARIABLES	(3) IV(1)FE AF_GDP	(4) IV(2)FE AF_GDP	(5) IV(1)FE AF_GDP	(6) IV(2)FE AF_GDP
C_aid_bilateral	67.80***	87.55***	67.51***	89.92***
	(20.50)	(30.08)	(22.38)	(34.21)
EM_AFGDP	1.924e+10	9.773e+09	1.919e+10	9.616e+09
	(7.583e+10)	(9.303e+10)	(7.604e+10)	(9.568e+10)
G7_aid	-10.76	-16.83	-11.14	-17.17
	(11.87)	(15.38)	(12.09)	(16.04)
D3_mkt_open			-4.991e+09	-1.577e+10
			(4.494e+10)	(5.711e+10)
D4_pol_conflict			1.025e+09	-3.560e+09
			(1.031e+10)	(1.353e+10)
Constant	1.966e+10**	1.684e+10	2.295e+10	2.812e+10
	(8.510e+09)	(1.067e+10)	(3.187e+10)	(4.020e+10)
Observations	192	192	192	192
Number of country	24	24	24	24

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 reports the second stage regression result of IV estimators. The IV(1) estimator with the fixed effect in model 3 is 67.80, and the IV(1) estimator with fixed effect after adding dummy variables of market openness and political conflict in model 5 is 67.51. Both represent that the magnitudes of IV(1) estimators are approximately twelve times larger than the magnitude of the OLS estimator in Table 1. Likewise, the IV(2) estimators in models 4 and 6 are 87.55 and 89.92, respectively, even sixteen times higher than the size of the OLS estimator in Table 1.

Table 5. The second stage regression with lagged China's aid(t-1)

VARIABLES	(3) IV(1)FE FWD1_AFGDP	(4) IV(2)FE FWD1_AFGDP	(5) IV(1)FE FWD1_AFGDP	(6) IV(2)FE FWD1_AFGDP
C_aid_biateral	62.39***	69.51***	60.67***	68.55***
	(18.14)	(23.71)	(19.44)	(26.08)
EM_AFGDP	6.327e+09	2.911e+09	6.258e+09	2.891e+09
	(6.709e+10)	(7.333e+10)	(6.604e+10)	(7.295e+10)
G7_aid	-8.887	-11.08	-9.125	-11.25
	(10.50)	(12.13)	(10.50)	(12.23)
D3_mkt_open			5.928e+09	2.136e+09
			(3.903e+10)	(4.354e+10)
D4_pol_conflict			3.605e+09	1.993e+09
			(8.957e+09)	(1.032e+10)
Constant	2.427e+10***	2.325e+10***	1.969e+10	2.151e+10
	(7.529e+09)	(8.411e+09)	(2.768e+10)	(3.065e+10)
Observations	192	192	192	192
Number of country	24	24	24	24

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 shows a similar result with the lagged period of China's aid and African GDP compared to Table 4. The IV(1) estimator with fixed effect in model 3 is 62.39, and the IV(1) estimator with fixed effect after adding dummy variables of market openness and political conflict in model 5 is 60.67. Both represent that the magnitudes of IV(2) estimators are approximately nine times larger than the magnitude of the OLS estimator and they are less than the results of the same models compared to Table 4. Likewise, the IV(2) estimators in models 4 and 6 are 69.51 and 68.55, respectively, are approximately ten times higher than the size of the OLS estimator. Also, both of them are much less than the result of the same models comparing to Table 4. The estimator with lagged China's aid can suggest that the marginal relationship between aid and GDP is decreasing over time.

One thing we can take from the above results is, since all the significant coefficients are consistently positive, there is convincing evidence that China's aid has a positive correlation with GDP in African countries. For reference, in the actual regression process, since available China's estimated aid data is limited from 2003 to 2014, it uses the observed forwarded African GDP rather than making lagged variables of China's aid data to avoid losing additional observations.

VI. Conclusion

From the regression result, the study finds that China's aid has a positive relationship with the African GDP. Using an instrumental variable for China's aid, the study reveals that the OLS estimator with the fixed effect is downward biased to the IV estimator. This means that, while the OLS estimator suggests that more of China's aid goes to the countries with low GDP, the IV estimator is able to capture a reverse causality that China provides aid to the country with a high GDP. As shown in the correlation coefficient figure 5 in Appendix, Nigeria (the fourteenth country listed below), the wealthiest nation in Africa, receives China's aid as other poor African countries do. Thus, using an instrumental variable enables this study to find the hidden behavior of China's aid, which is different from G7 donors.

Another explanation for the difference between IV and OLS estimators could be an omitted variable problem that affects both the independent and dependent variables. Since the effect of this omitted variable is falsely captured by China's aid, it leads to over-estimating the

direct effect of China's aid on African GDP. Although the study considering that bilateral investment is the omitted variable, it is challenging to find the bilateral investment data between China and African countries who received aids since it is closed information. Moreover, the difference in the coefficient of China's aid between OLS with fixed effects and IV estimation can come from the measurement error. Although it is the best measurement so far, since this study used the estimated aid data collected in the field by capturing the total volume, the aid will inflow divided by 5 to 10 year periods.

As for the implication of the result, from the recipient's view, China's aid on African GDP is not bad for African GDP growth. Considering that China recently announced a debt relief plan in 2018 for its recipient countries, it can reduce the current woes of indebting poor countries and increase the magnitude of its positive impact on Africa's economic development. It can also be used as a new financial source in the current economic depression in the world economy, which can relieve the poverty level in Africa. On the other hand, even though the aid is generally considered a positive impact factor in the recipient's view, it can negatively impact the donor's group by urging aid competition new against traditional donors.

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VIII. Appendix

Table 6. Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
country	overall	12.5	6.934236	1	24	N = 288
	between		7.071068	1	24	n = 24
	within		0	12.5	12.5	T = 12
year	overall	2008.5	3.458061	2003	2014	N = 288
	between		0	2008.5	2008.5	n = 24
	within		3.458061	2003	2014	T = 12
AF_GDP	overall	3.11E+10	7.00E+10	7.85E+08	5.68E+11	N = 288
	between		6.38E+10	1.75E+09	3.20E+11	n = 24
	within		3.15E+10	-1.86E+11	2.79E+11	T = 12
FWD1_AFGDP	overall	3.41E+10	7.50E+10	9.15E+08	5.68E+11	N = 288
	between		7.03E+10	1.93E+09	3.53E+11	n = 24
	within		2.96E+10	-1.88E+11	2.50E+11	T = 12
C_aid_1	overall	2.68E+08	5.33E+08	1	3.78E+09	N = 288
	between		2.83E+08	1.14E+07	1.07E+09	n = 24
	within		4.55E+08	-7.99E+08	3.10E+09	T = 12
EM__AFGDP	overall	0.06666	0.0895572	0.001456	0.462818	N = 288
	between		0.0820854	0.015296	0.367437	n = 24
	within		0.0392523	-0.07591	0.335848	T = 12
G7_aid	overall	5.36E+08	7.96E+08	-5.78E+07	1.01E+10	N = 288
	between		4.50E+08	4.47E+07	1.87E+09	n = 24
	within		6.62E+08	-1.16E+09	8.78E+09	T = 12
D3_mktopen	overall	0.670139	0.4709809	0	1	N = 288
	between		0.4768045	0	1	n = 24
	within		0.0565151	0.586806	1.586806	T = 12
D4_politic_conflict	overall	0.243056	0.429675	0	1	N = 288
	between		0.2419185	0	0.5	n = 24
	within		0.3582445	-0.25694	1.076389	T = 12

Table 7. Summary results statistics of first-stage regressions for IV(1)

IV(1)			Underidentification		Weak identification
Variable	F(1, 165)	P-val	SW Chi-sq(1)	P-val	SW F(1, 165)
C_aid	14.99	0.0002	15.27	0.0001	14.99

Stock-Yogo weak ID F test critical values for single endogenous regressor:

10% maximal IV size	16.38
15% maximal IV size	8.96
20% maximal IV size	6.66
25% maximal IV size	5.53

Underidentification test

Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified)
Ha: matrix has rank=K1 (identified)
Anderson canon. corr. LM statistic Chi-sq(1)=13.99 P-val=0.0002

Weak identification test

Ho: equation is weakly identified
Cragg-Donald Wald F statistic 14.99

Stock-Yogo weak ID test critical values for K1=1 and L1=1:

10% maximal IV size	16.38
15% maximal IV size	8.96
20% maximal IV size	6.66
25% maximal IV size	5.53

Weak-instrument-robust inference

Tests of joint significance of endogenous regressors B1 in main equation
Ho: B1=0 and orthogonality conditions are valid
Anderson-Rubin Wald test F(1,165)= 41.29 P-val=0.0000
Anderson-Rubin Wald test Chi-sq(1)= 42.04 P-val=0.0000
Stock-Wright LM S statistic Chi-sq(1)= 33.62 P-val=0.0000

Number of observations	N =	192
Number of regressors	K =	3
Number of endogenous regressors	K1 =	1
Number of instruments	L =	3
Number of excluded instruments	L1 =	1

Table 8. Summary results statistics of first-stage regressions for IV(2)

IV(2)			Underidentification		Weak identification
Variable	F(1, 165)	P-val	SW Chi-sq(1)	P-val	SW F(1, 165)
C_aid	10.12	0.0018	10.31	0.0013	10.12

Stock-Yogo weak ID F test critical values for single endogenous regressor:

10% maximal IV size	16.38
15% maximal IV size	8.96
20% maximal IV size	6.66
25% maximal IV size	5.53

NB: Critical values are for Sanderson-Windmeijer F statistic.

Underidentification test

Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified)
Ha: matrix has rank=K1 (identified)
Anderson canon. corr. LM statistic Chi-sq(1)=9.71 P-val=0.0018

Weak identification test

Ho: equation is weakly identified
Cragg-Donald Wald F statistic 10.12

Stock-Yogo weak ID test critical values for K1=1 and L1=1:

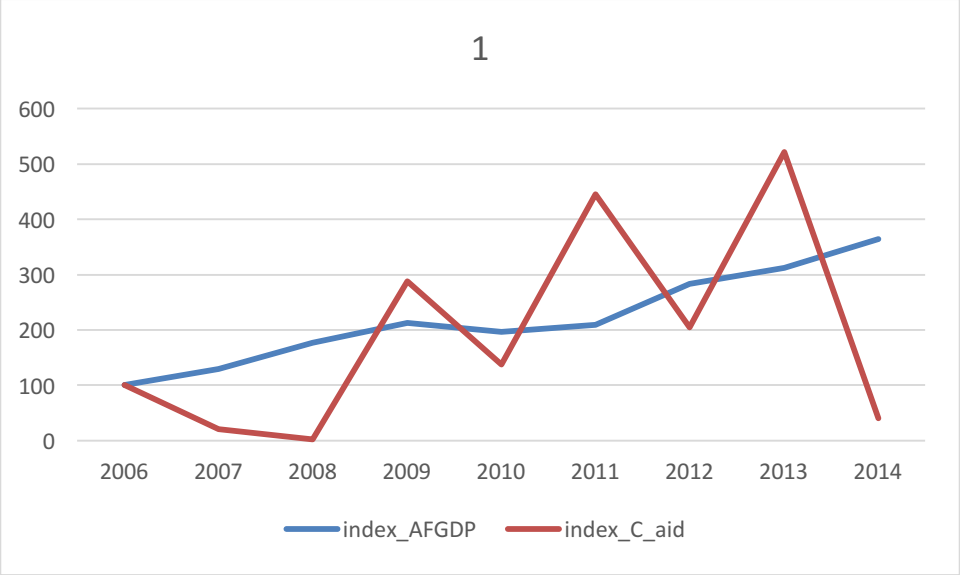
10% maximal IV size	16.38
15% maximal IV size	8.96
20% maximal IV size	6.66
25% maximal IV size	5.53

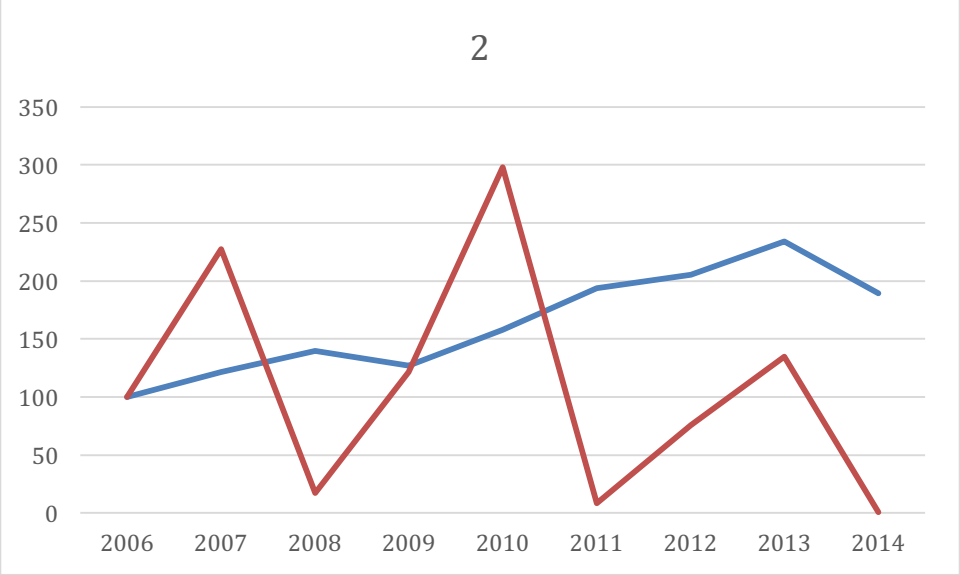
Weak-instrument-robust inference

Tests of joint significance of endogenous regressors B1 in main equation
Ho: B1=0 and orthogonality conditions are valid
Anderson-Rubin Wald test F(1,165)= 49.72 P-val=0.0000
Anderson-Rubin Wald test Chi-sq(1)= 50.63 P-val=0.0000
Stock-Wright LM S statistic Chi-sq(1)= 38.90 P-val=0.0000

Number of observations	N =	192
Number of regressors	K =	3
Number of endogenous regressors	K1 =	1
Number of instruments	L =	3
Number of excluded instruments	L1 =	1

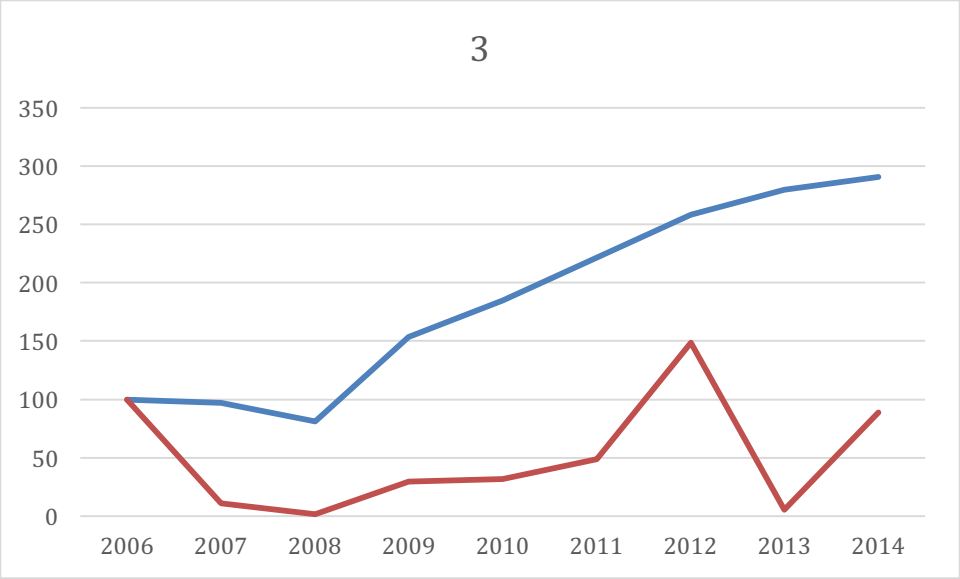
Figure 5. Correlation between African GDP and China's aid (base year 2006) [14]

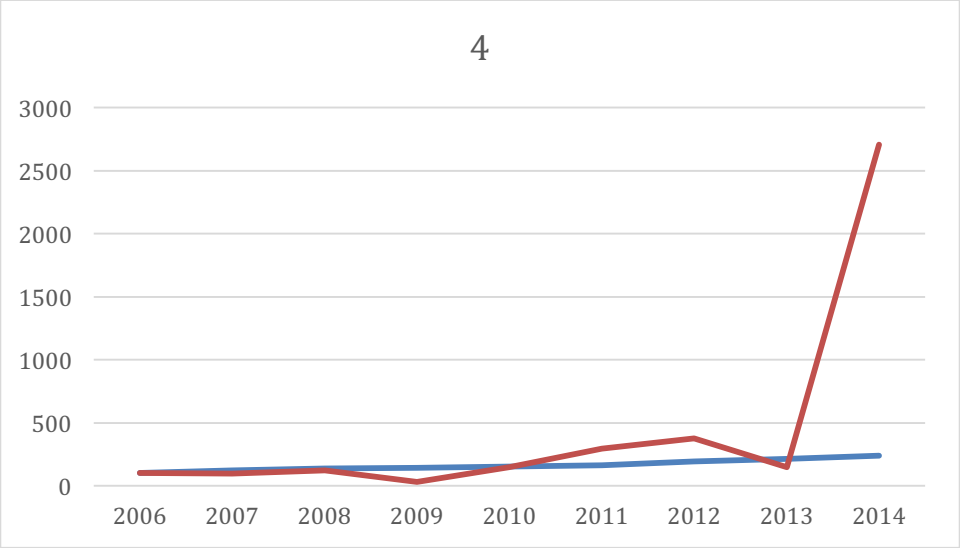




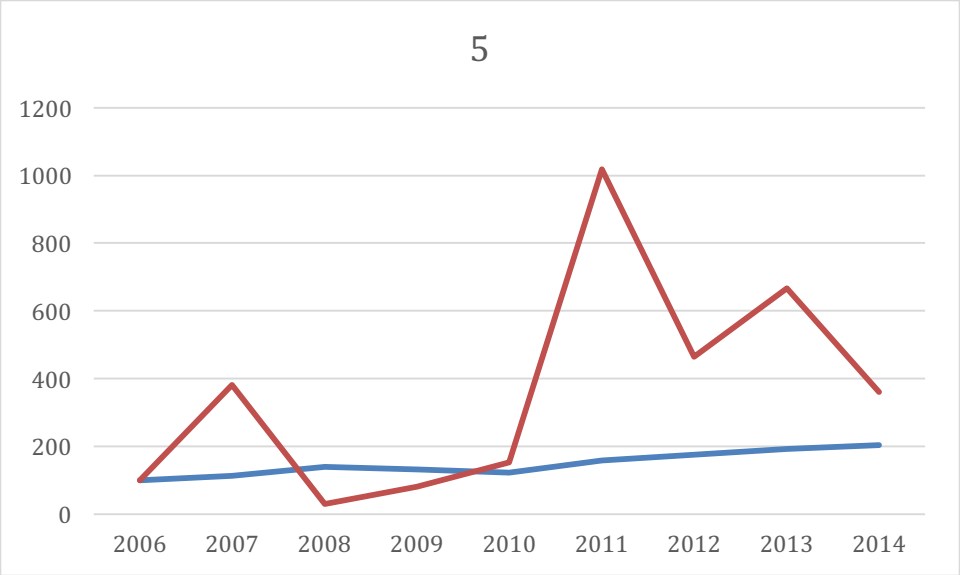
[14] Country code:

1. Ethiopia
2. Ghana
3. Zimbabwe
4. Kenya
5. Mozambique
6. Sudan
7. Tanzania
8. Niger
9. Cameroon
10. Cote D'Ivoire





11. Angola
12. Uganda
13. Zambia
14. Nigeria
15. Congo, Dem. Rep.
16. Mali
17. Malawi
18. Guinea
19. Mauritius
20. Chad
21. Rwanda
22. Sierra Leone
23. Burundi
24. Congo, Rep.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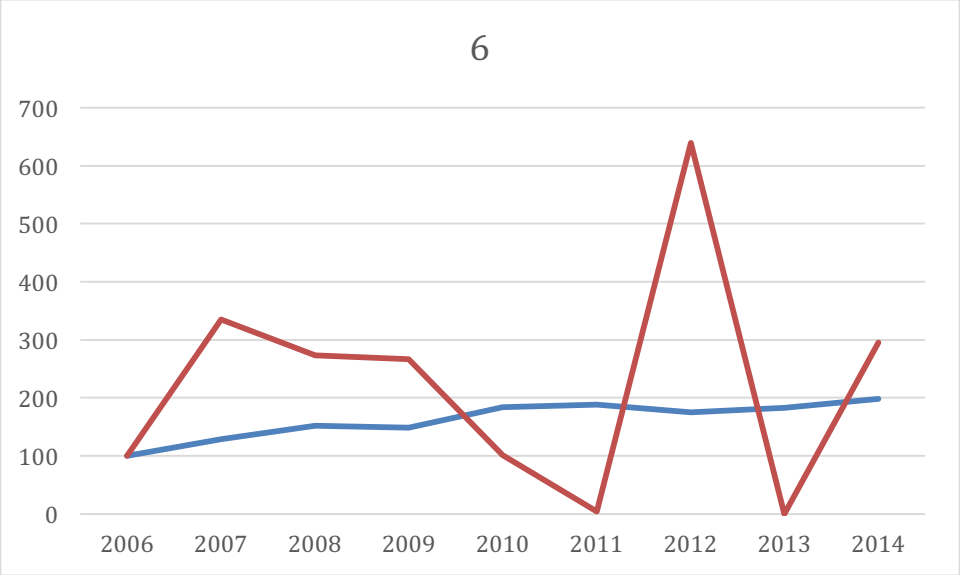
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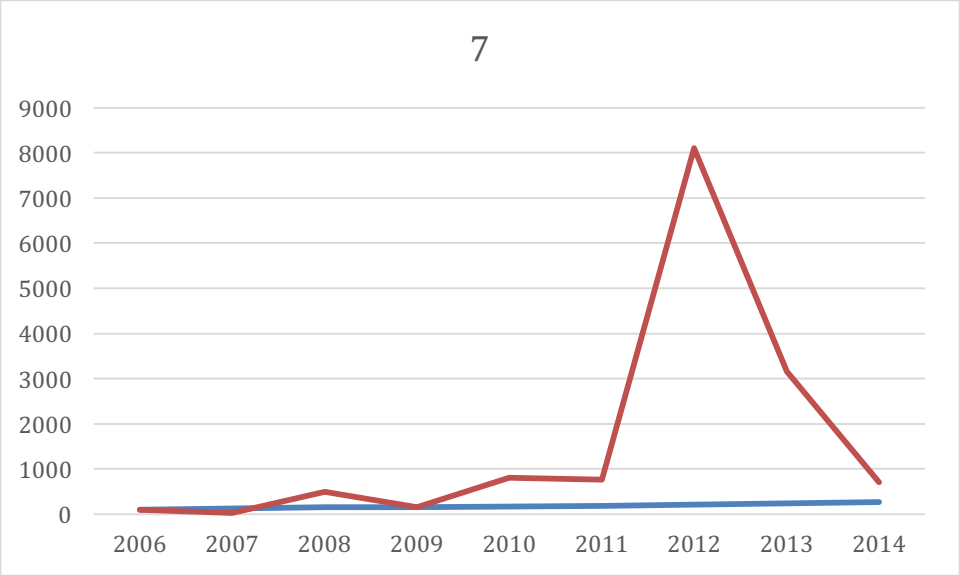
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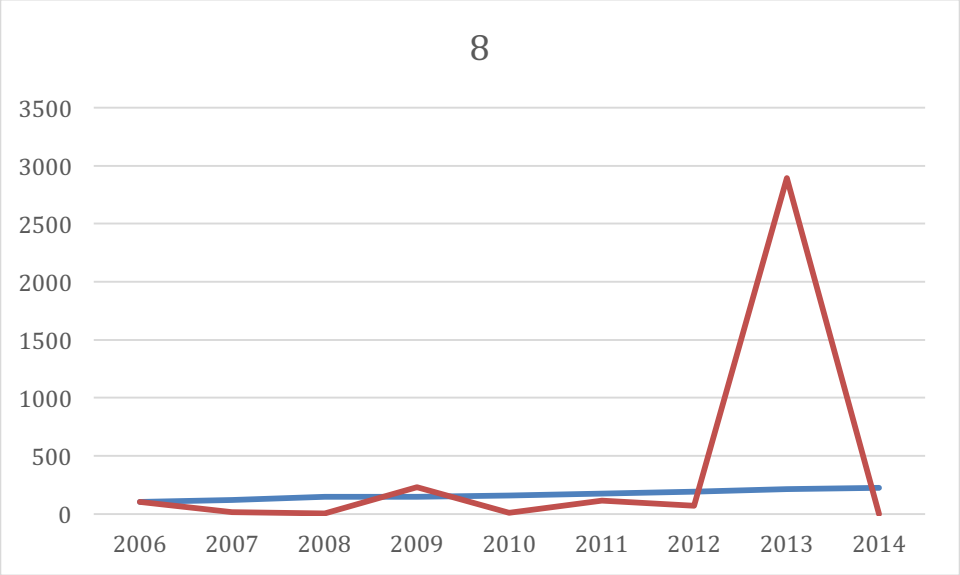
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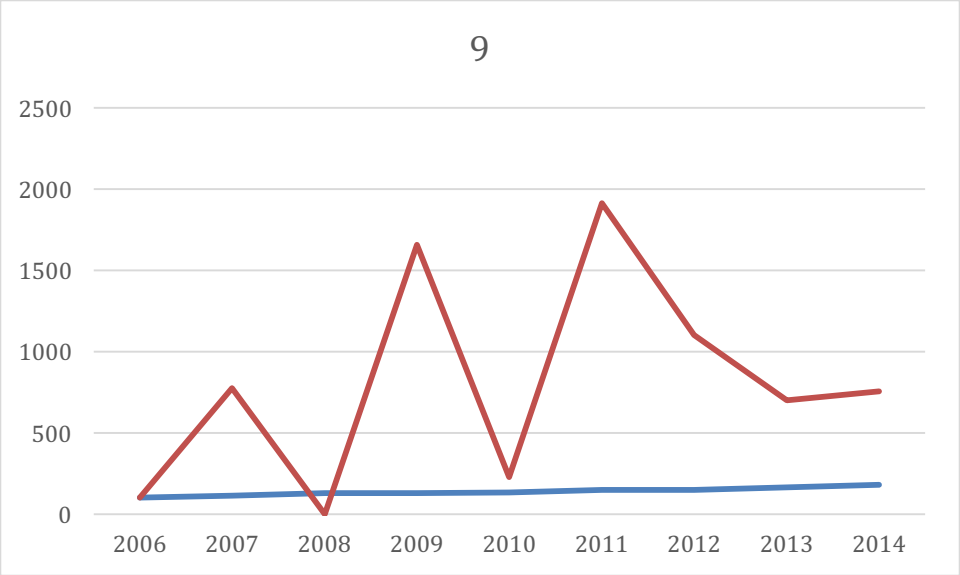
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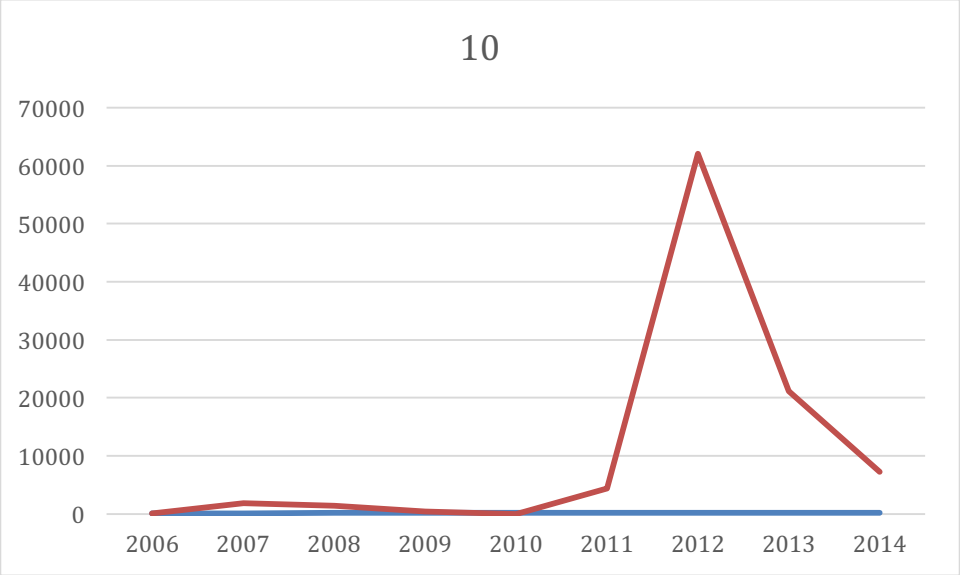
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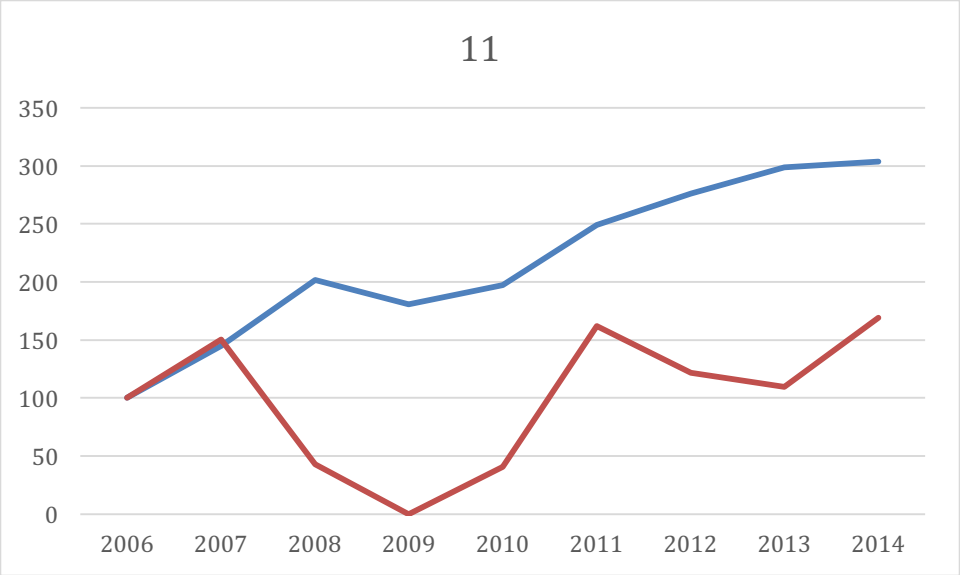
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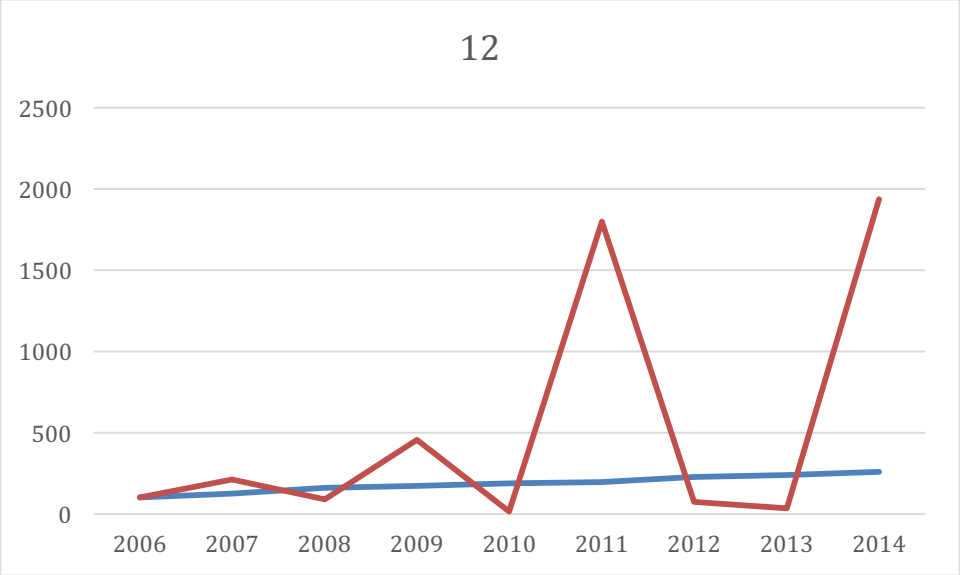
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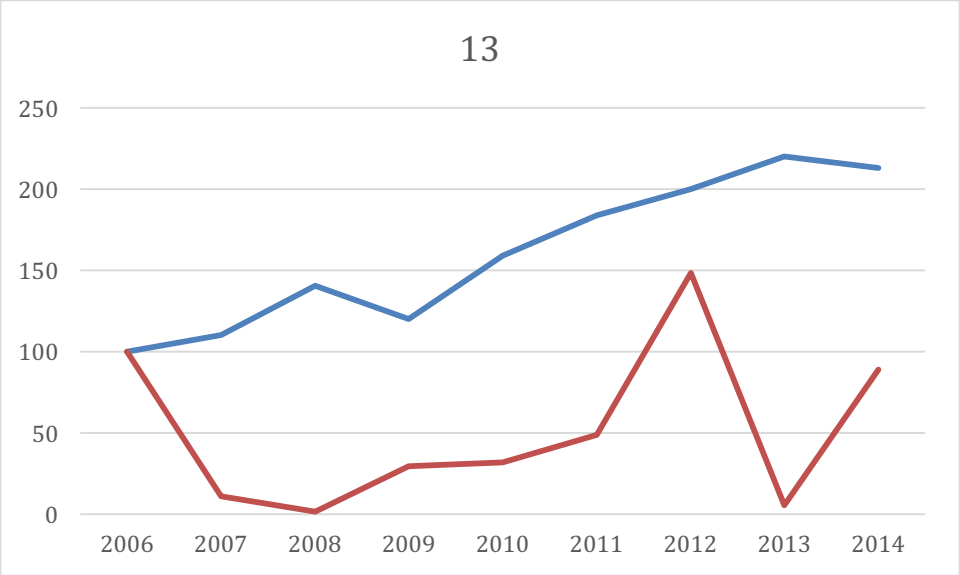
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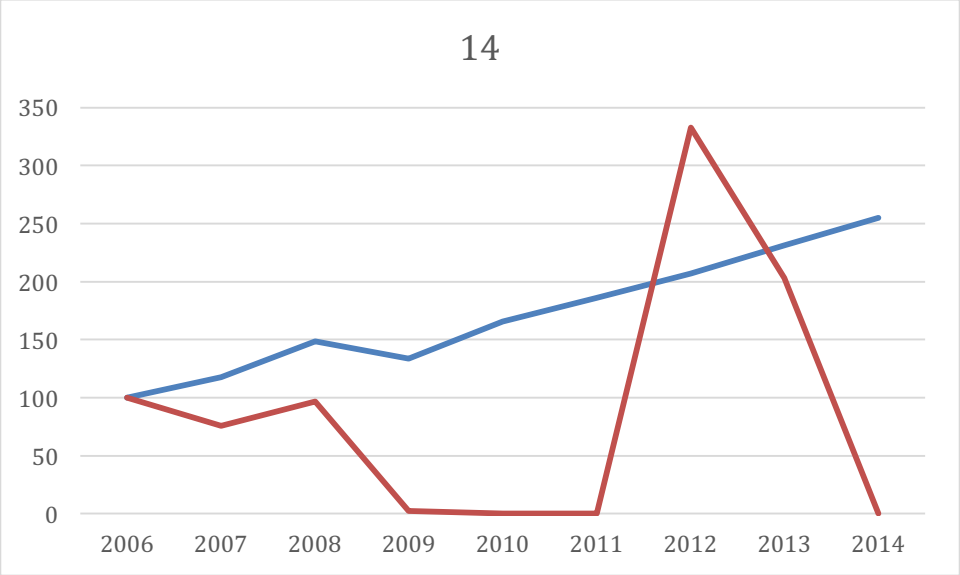
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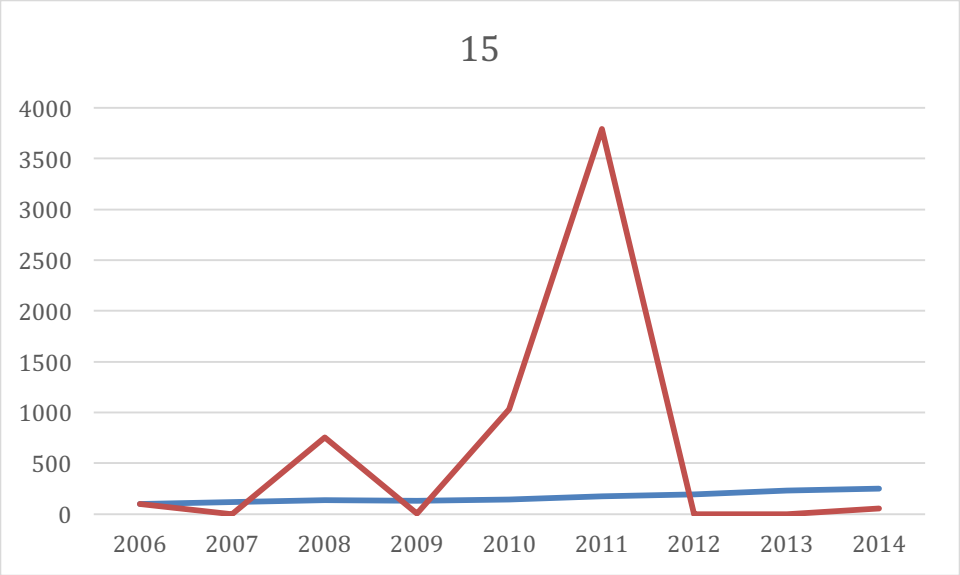
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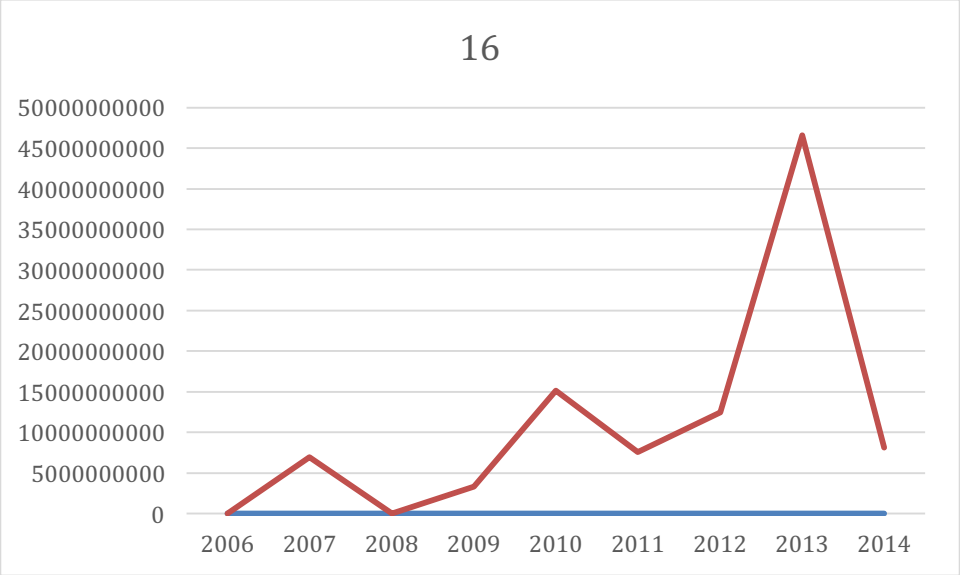
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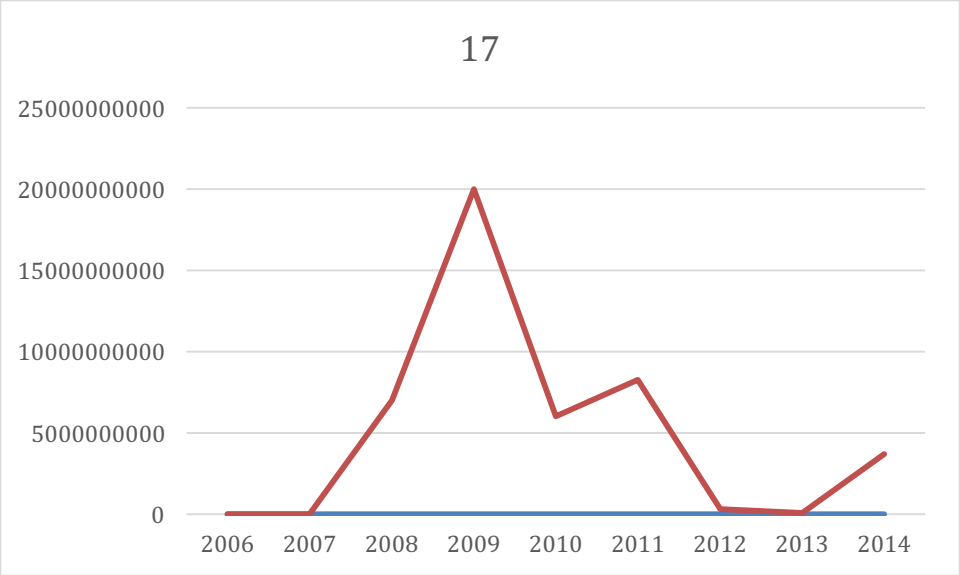
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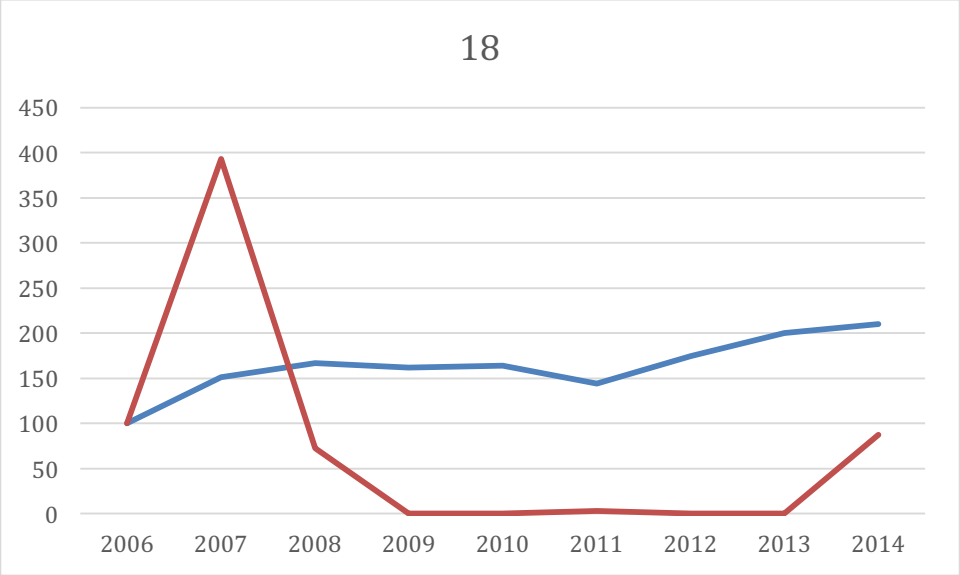
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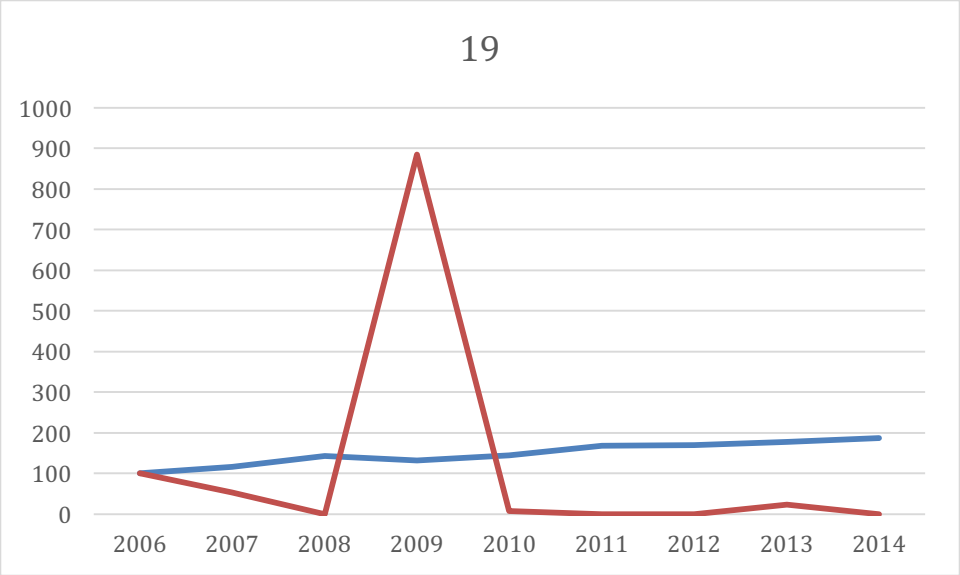
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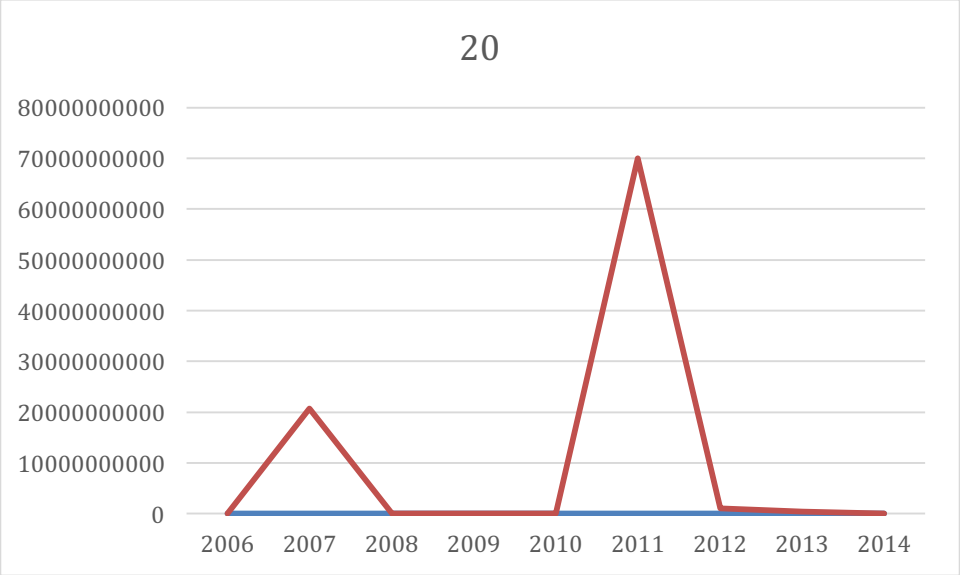
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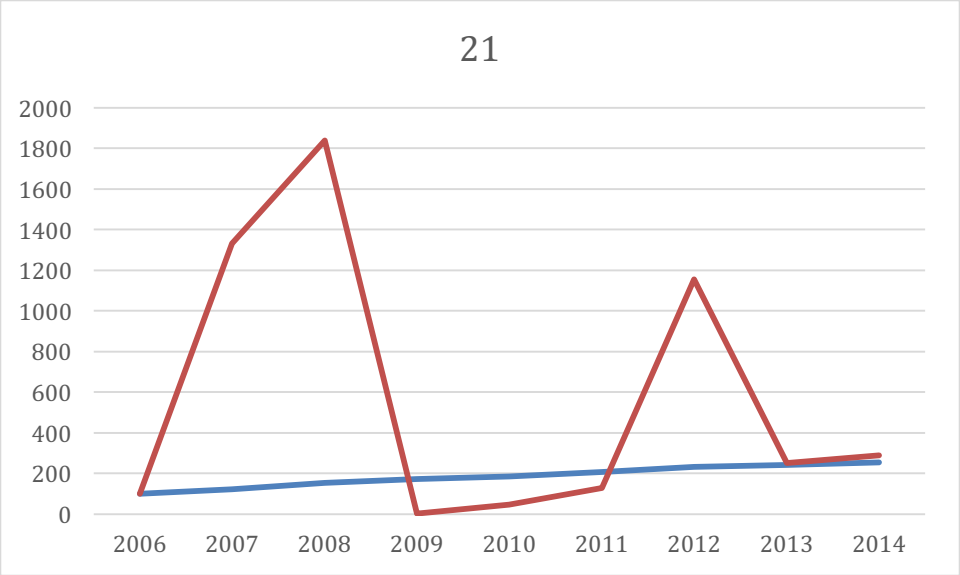
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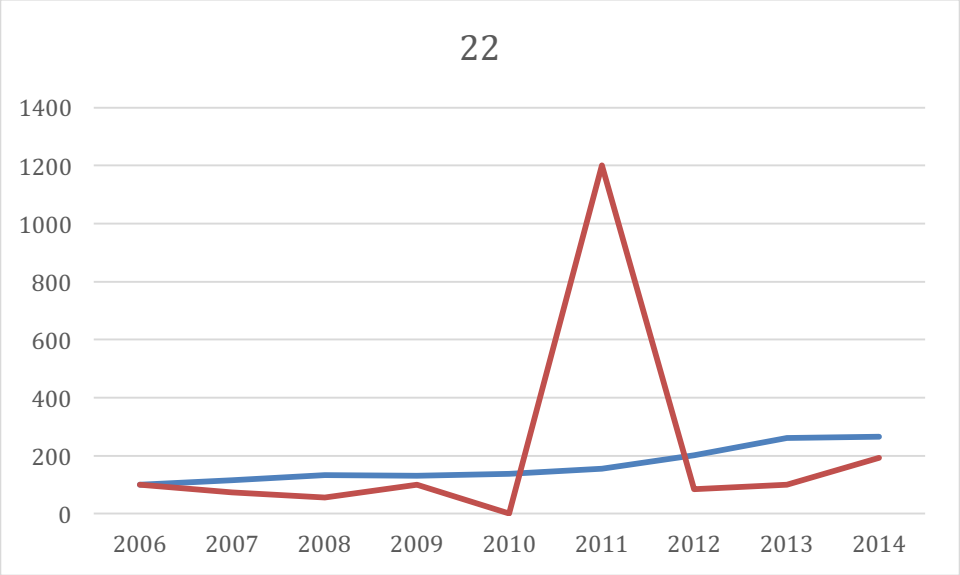
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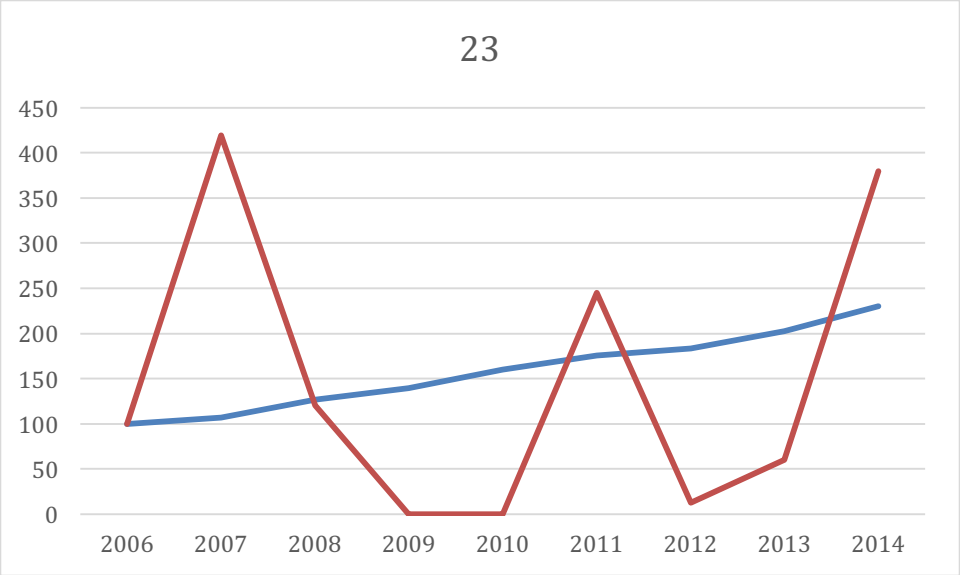
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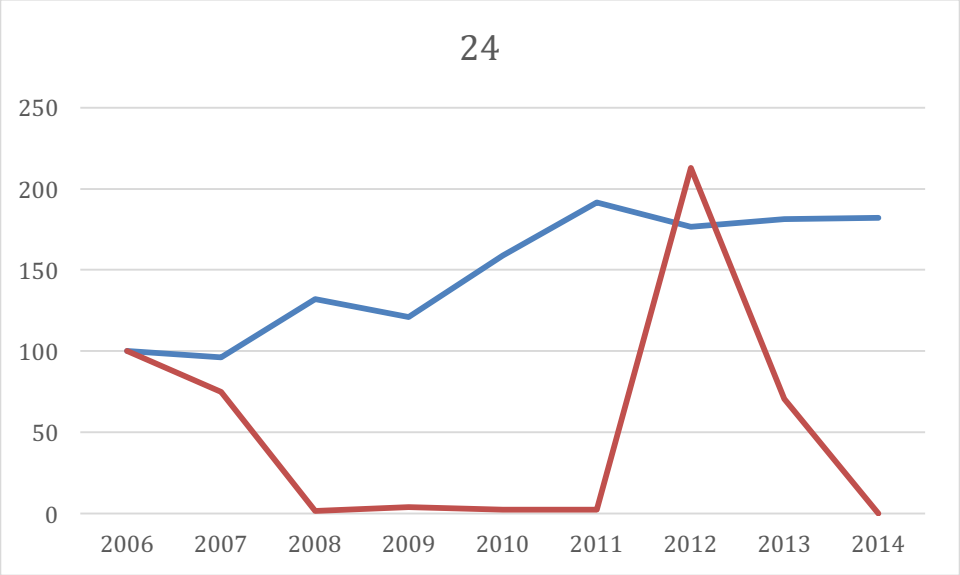
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