Chinese Foreign Aid Allocation to African Countries in Relation to Perceived Diplomatic Relations: A Computational Approach

Du Baichen (Albert); Luo Jiali (Jasline); Zhao Tianlang (Leona)

POLI3148
Poster Presentation

Introduction

In recent decades China has become one of the competitive donors in giving foreign aid while the diplomatic and political strategies of China reflected in aid-giving practices (Fink & Redaelli, 2011). Some researches attempts were given to study the driving factors of Chinese aid allocation and discovered that population size, economic cooperation and diplomatic relations are influential in aid allocation (Yushi et al., 2020; Dreher & Fuchs, 2015) and the country's need (Dreher & Fuchs, 2015). However, existing studies tend to adopt a binary measurement of recipient-side by diving recipient countries into in-line or not in-line with China on UN vote, without considering the definition or perception of such diplomatic closeness from the donor-side. Hence, we attempt to offer a more detailed description of diplomatic relations by measuring China's perceived closeness and corresponding aid allocation to the recipient country. Our study focuses on the period 2000- 2017 when there is active China-Africa interactions and significant Chinese engagement in foreign aid. By applying a computational methodology, we try to dive in:

Is there a relationship between China's perceived diplomatic relations with African countries and corresponding foreign aid provision?

Data & Measurements

Dependent variables

Our study covers Chinese aid flow to 52 African countries for the periods 2000-2017, based on the availability of data. The data is gathered from AidData's Global Chinese Development Finance Dataset. To measure aid allocating behaviors, among all the predictors, we developed 3 indicators for China's aid allocation:

Programme count: total number of aid programmes to given country.
Intent: the programme is developmental/ representational/ commercial
Flow Class: the programme is ODA / OOF / unclear

Independent variable

To measure the perceived degree of closeness in bilateral relations between China and the given African country, we adopted the description of diplomatic history from the official website of Foreign Ministry of PRC and used word frequency of "年"(year) and "月"(month) because in the formatting of diplomatic history, there is one bilateral interaction after each year-month description. Therefore, such word frequency is taken as indicating interaction frequency, thus measuring the closeness degree of relations.

Control variables

To explore the correlation, we introduced a few control variables into the model. Then were broadly divided into two categories, based on previous studies: needs of the recipient country and merits of the recipient government.

Needs indicators were measured by recipient population, elderly population, and healthcare spending (as for welfare system). They were utilized from open data sources including the World Bank and WTO.

Merits indicators were taken from the Worldwide Governance Indicators including control of corruption, accountability, and government effectiveness. They were utilized from several open data sources including Freedom House, Transparency International and World Economic Forum.

Exploratory Data Analysis

Data Wrangling

To utilize all the datasets available, we first selected 36 variables out of 143 available from the open source data's and filtered out African countries, based on our purpose of study and cleaned the dataset using regular expressions. Later, we selected, divided and grouped them into 3 datasets according to the IV indicators, and the 2nd round selection is based on data cleanliness and data availability. From the 3 groups of programme-level datasets, we also reproduced country-level data by grouping and reshaping the data frames.

Exploratory Data Analysis

We find several features of the data during EDA:

- The intent of the aid programmes are mostly developmental, if not mixed; (Figure 1)
- The aid programmes are mostly official developmental assistance, which corresponds to the intent indicator; (Figure 2)
- Year and Month are the most frequent words across the bilateral relation history documents from FMPRC. (Figure 3)
- Word frequency of Year and Month varies significantly from country to country, indicating varying frequency of bilateral interaction. (Figure 4)

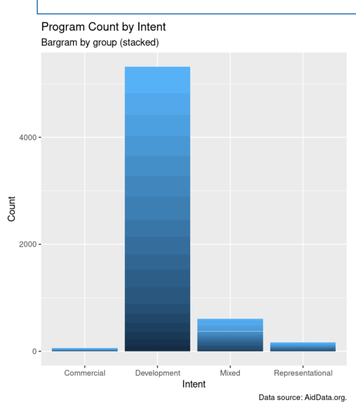

Figure 1. Intent

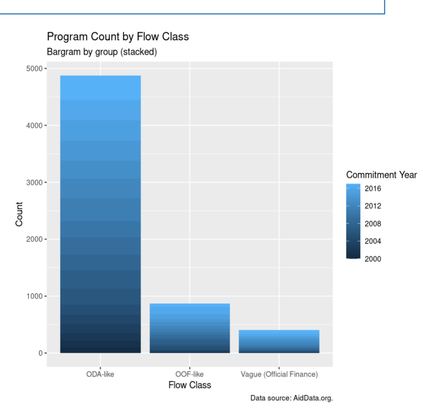

Figure 2. Flow Class

Natural Language Processing

Web Scraping

First, we try to establish an index. We visually inspected the website of Foreign Ministry, especially the part that introduces different regions and countries. We found that the website is structured. As long as we can get the URL of each country, we will get all the information we need. We use Rvest to retrieve all text and URL for each country, using html_nodes(), and html_attr("href"). However, we later found that these URLs do not contain any information we need, due to the redirection method used by the host. But the redirection mechanism is inferable, which means the suffixes of URLs are inferable from the URL of a higher level.

For example, the original link to Japan, which is what we get from the page of Asian Countries, is: *https://www.fmprc.gov.cn/web/gjhdq_676201/gj_676203/yz_676205/1206_676836/*
When we click it, the website will redirect us to: *https://www.fmprc.gov.cn/web/gjhdq_676201/gj_676203/yz_676205/1206_676836/1206x0_676838/*

The last suffix can be inferred from the original link. Everything before the underscore in /1206_676836/ is added with a string of "x0", and everything after the underscore is added with 2. Following the rule and using stringr package, we managed to get all true URLs of each country as our indexes. Then, we download all html files into a separate folder, naming them with the number that was established in our index. All pages are in .html, which spares us the effort to write another set of code to deal with other formats. For these pages, they are not what we finally want. We went into another round of indexing. We again used html_nodes(), and html_attr("href") to get the link to "双边关系". The indexing number is unchanged. Finally, we use html_nodes() to get the part between and in each html file, which is the description of bilateral relations between China and each country.

Text Mining

Text mining is aimed at retrieving a parameter to measure the Chinese government's perception of the importance of the relation between China and each country. After visual inspection, we found that each text file has different ways of presenting relevant information. Some organize the events around topics, such as economic affairs, while others organize information chronologically. Despite the messiness of texts, we found an interesting pattern, every event between two countries is preceded with the format of "xxxx年xx月". If we make reasonable statistics about these two Chinese characters, we can get how many interactions the two countries have had, which to some extent reflect the importance of that bilateral relations to China.

In R, the original text files are paired to the indexing data frame. We later tokenize them using JiebaR, a tokenizing package for Chinese texts. We cleaned the tokenized texts, deleting all English letters, some of which are html syntax and are falsely included in the part. We also deleted all numbers. Finally, we decide to count the number of all "年" and "月" as a measurement of perceived closeness to China. These two characters have the lowest tf-idf among all words, indicating that they are common among all texts.

Figure 3. Word Cloud

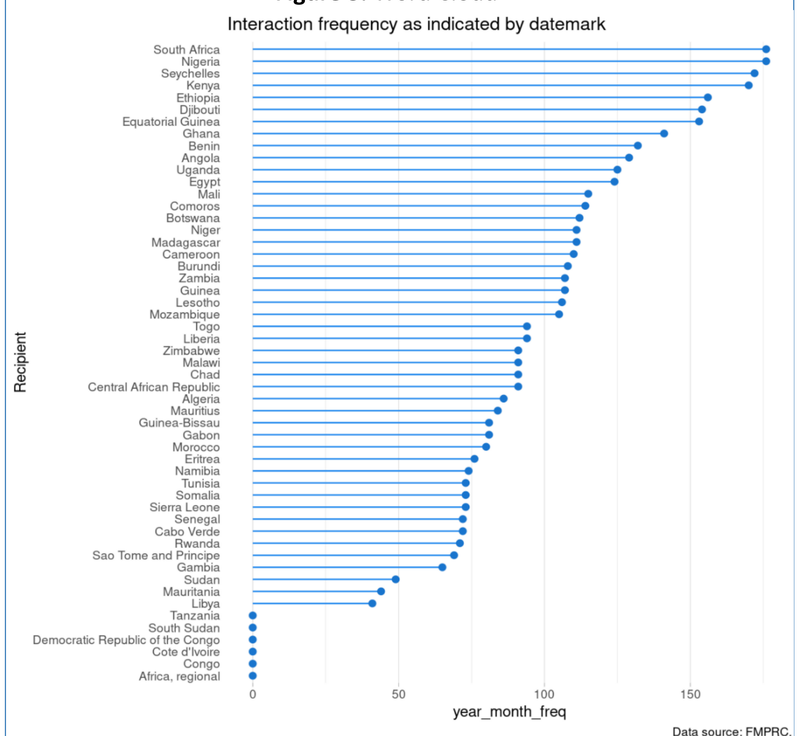

Figure 4. Word Frequency

Regression Results & Findings

Logistic Regression Model

To better predict the probabilities of the categorically distributed dependent variables, as in our case, we feed the output values from the regression line to the sigmoid function, which returns the probability for each output value from the regression line. Thus, based on a predefined threshold value, we classify the output into two classes.

Project Intent as Dependent Variable (See Figure 5)

Model Fit Measures

Model	Deviance	AIC	R^2_{McF}
1	1287	1309	0.104

Model Coefficients - Intent

Predictor	Estimate	SE	Z	p
Intercept	−6.29184	0.74645	−8.429	<.001
polity	−0.05430	0.04448	−1.221	0.222
freedom_score	−0.00854	0.01009	−0.847	0.397
corruption_score	0.06810	0.01764	3.861	<.001
population	−4.23e−9	3.17e−9	−1.335	0.182
elderly_population	0.14378	0.04316	3.331	<.001
healthcare_expenditure	0.14048	0.04333	3.242	0.001
government_transparency	−0.13418	0.41228	−0.325	0.745
government_efficiency	0.55113	0.81644	0.675	0.500
spending_efficiency	−1.28198	0.33578	−3.818	<.001
year_month_frequency	0.02477	0.00460	5.378	<.001

Note. Estimates represent the log odds of "Intent = Non-Developmental" vs. "Intent = Developmental"

Figure 5. Binary Logistic Regression of Intent

Based on the estimate of the predictor Year and Month Frequency, we find that the bilateral interaction frequency is negatively correlated with the intent of non-developmental assistance ($p < 0.05$).

Namely, the result indicates that

- The more frequent the interaction with China is, the more likely China give assistances for developmental projects, rather than mere representational or commercial projects, which tends to be self-interested.

Flow Class as Dependent Variable (See Figure 6)

Model Fit Measures

Model	Deviance	AIC	R^2_{McF}
1	3120	3142	0.0725

Model Coefficients - flow_class

Predictor	Estimate	SE	Z	p
Intercept	2.6746	0.40902	6.539	<.001
polity	−0.0252	0.02410	−1.044	0.297
freedom_score	0.0158	0.00544	2.906	0.004
corruption_score	−0.0418	0.01084	−3.862	<.001
population	−2.53e−9	1.81e−9	−1.397	0.162
elderly_population	−0.0253	0.02827	−0.895	0.371
healthcare_expenditure	0.0408	0.02728	1.497	0.134
government_transparency	−0.2736	0.23649	−1.157	0.247
government_efficiency	−0.4702	0.47715	−0.985	0.324
spending_efficiency	1.1702	0.20469	5.717	<.001
year_month_frequency	−0.0115	0.00290	−3.965	<.001

Note. Estimates represent the log odds of "flow_class = ODA" vs. "flow_class = Non-ODA"

Figure 6. Binary Logistic Regression of Flow Class

Based on the estimate of the predictor Year and Month Frequency, we find that it is positively correlated with the flow class of official developmental assistance (ODA) as recognized by the UN ($p < 0.05$).

To explain, the result indicates that:

- The more frequent the interaction with China is, the more recognized official assistances from China are likely to be given, rather than other flows, which is more likely to be based on self-interest.

References

1. Center for Systematic Peace, (2015.) Policy5 Project. Retrieved from https://www.systemicpeace.org/polityproject.html
2. Custer, S., Dreher, A., Elston, T.B., Fuchs, A., Ghose, S., Lin, J., Malik, A., Parks, B.C., Russell, B., Solomon, K., Strange, A., Tierney, M.J., Walsh, K., Zaleski, L., and Zhang, S. 2021. *Tracking Chinese Development Finance: An Application of AidData's TUFF 2.0 Methodology*. Williamsburg, VA: AidData at William & Mary.
3. Dreher, A., & Fuchs, A. (2015). Rogue aid? An empirical analysis of China's aid allocation. *Canadian Journal of Economics/Revue canadienne d'économique*, *48*(3), 988-1023.
4. Freedom House, (2019). Freedom scores for countries. Retrieved from https://freedomhouse.org/countries/freedom-world/scores
5. Fink, G., & Redaelli, S. (2011). Determinants of international emergency aid–humanitarian need only? *World Development*, *39*(5), 741–757.
6. Sun, C., & Liu, Y. (2019). Can China's diplomatic partnership strategy benefit outward foreign direct investment?. *China & World Economy*, *27*(5), 108-134.
7. Transparency International, (2019). Corruption Perception Index. Retrieved from https://www.transparency.org/en/cpi/2019/index/nzl
8. World Economic Forum, (2020). Global Competitiveness Index by the World Economic Forum. Retrieved from https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth
9. World Trade Organization, 2018. Health Spending as of GDP 2017. Retrieved from https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS
10. Yushi, J., Borojo, D. G., Miao, M., & Zhang, X. (2020). The driving factors of Chinese aid allocation to African countries. *Cogent Business & Management*, *7*(1), 1812219.