UNDERGRADUATE RESEARCH

ANALYSIS OF U. S. FOREIGN AID DETERMINANTS FOR 2003[1]

Joshua M. Hill and Christopher C. Klein[2]

Many countries throughout the world face the problem of providing the basic benefits of government to their citizens. There are many factors that could lead to this major problem including: corruption within the government, poor tax system, badly devised budgets, or the low income of the citizens does not provide enough revenue for the government to operate efficiently. There are several ways that more developed nations set out to help these countries. The United States is the largest provider of foreign aid in the world with roughly $16.3 million contributed in 2003 (OECD). Although aid is given for the purpose of developmental assistance, the process often becomes politicized. This has been observed most recently in an incident in Kyrgyzstan. The Kyrgyzstani government chose to evict a key U.S. military base due to political pressure from Russia. Russia offered the Kyrgyz a $2 billion loan and $150 million in aid, roughly forty times more than the current U.S. level of aid (Harding). How does the U.S. determine its foreign aid distribution?

Surprisingly, little literature exists on this question. Atwood, *et al* (2008), Radelet (2003), and Lancaster (2000), for example, argue for improvements in, or reform of, foreign aid policies. Among recent research, only Travis and Zahariadis (2002) econometrically analyze actual aid data, but emphasize U.S. political factors rather than the economic characteristics of aid recipients other than GDP.

In considering the determinants of foreign aid, the welfare of the country receiving aid is an obvious first choice since data can be collected on Gross Domestic Product (GDP) or Gross National Income from various sources. We hypothesized that that aid may be distributed based on countries' needs. In other words, countries could be prioritized with the most needy receiving the most amount of aid. This could present a problem if every aid donor used the same system, however, as the poorest country could end up monopolizing the aid. More than just need is likely at stake.

Other indicators may not be measured in dollars but are good measures of the overall welfare and level of economic development of a country. After looking for data that would be applicable, other indicators of development were located: as CO_2 emissions as a measure of industrialization; percent of children receiving a measles immunization shortly after birth as a measure of the medical system; percent of the country's land used for agriculture; and the percent of population that are regular internet users. The amount of U.S. exports and imports by country could also affect aid.

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[2] Joshua M. Hill is now a graduate student in Economics at Middle Tennessee State University; Christopher C. Klein is Associate Professor, Economics and Finance Department, Middle Tennessee State University, cklein@mtsu.edu.

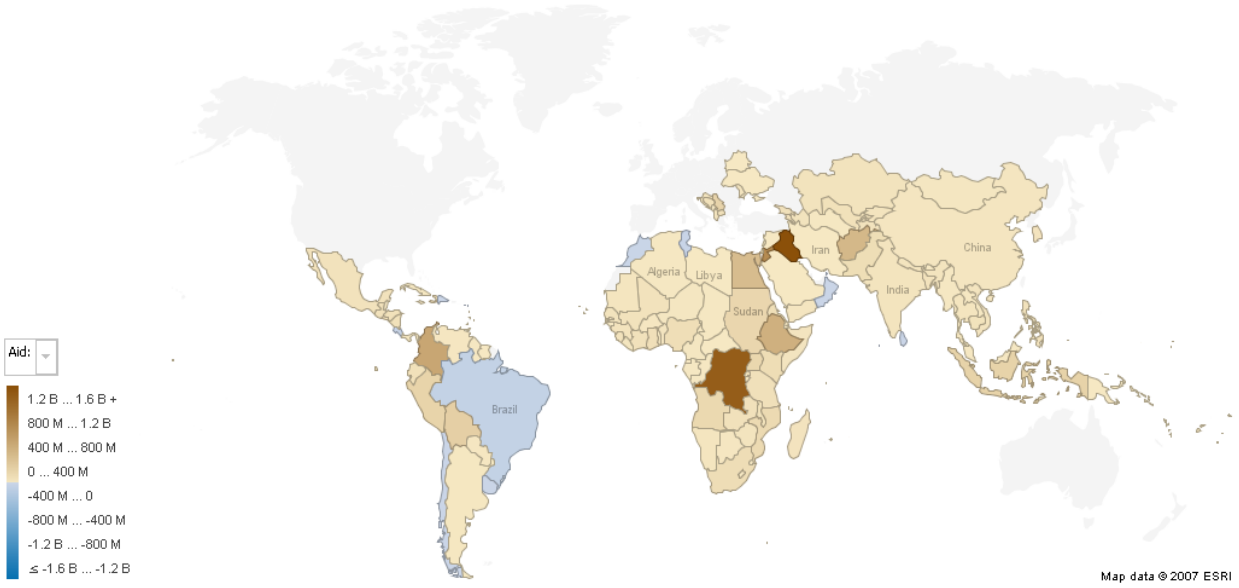

Figure 1: Map of U.S. ODA inflows and outflows for 2003. Visualized using Many Eyes, IBM®
Source: OECD DAC statistical database

Table I: Variable Definitions, Means, and Standard Deviations
Year 2003 ($ = 2008 U.S. dollar)

Variables	Mean	SD	Description
AID	$100904489.8	$222346805.6	Total ODA per country in 2003
GDPpC	$1509.940405	$1691.1718	Gross Domestic Product per capita
IU	444552.1219	1684929.429	Internet users per 100 people
CO2	95530650.23	451440437.9	Tons of Carbon Dioxide emissions per person
IMMU	78.94897959	17.70454683	Immunization, measles(% of children ages 12-23 months)
POP	44455212.19	168492942.9	Population of country
AGRI	288018.9242	675556.2138	Number of square kilometers of agriculture land
IMP	$5330864014	$24728003703	Total dollar value of U.S. imports from country
EX	$2379354666	$12193062737	Total dollar value of U.S. exports to country

The aid statistic selected for this study is the outflow of Official Development Assistance, or ODA, in the year 2003. The data were collected from the OECD's Developmental Assistance Committee's aid statistics database. ODA is defined as monetary based aid provided by an official government agency. This aid need not be completely concessional, but must have a twenty-five percent grant element. This allows countries to pay back part of the aid once their economies become more developed. ODA does not include food aid, medical aid, or any aid from private firms or individuals. It also does not take into account the economic effects of outside government activity such as an overseas military base that creates jobs for the receiving country.

For the welfare and development statistics, we relied mainly on the World Bank's World Development Indicators online database. Data on GDP, population, internet usage, immunization statistics, agricultural statistics, and CO_2 emissions were collected. Trade data are from the U.S. Census Bureau's Foreign Trade Division. In order to create a correct analysis of the data, the dollar amounts are expressed in real terms and not in nominal amounts from different years. Most of the data were in 2008 dollars. The trade data grew at a rate of 3.25% per year from 2003 dollars. GDP was divided by population to receive a more accurate measure of the welfare of the country by using GDP per capita. In total, data were collected for ninety-seven countries.

After collecting the data, a regression model was set up with ODA as the dependent variable and the rest of the data as independent variables. This regression produced results that were not statistically significant. All of the regression results are summarized in Table II. All statistical procedures were conducted in Excel.

Collinearity among the explanatory variables was evaluated by calculating the correlation coefficient for each pair of variables. Only IMP and EX were correlated at better than 0.5, with only EX surviving in the final regression.

A log-linear form was then utilized to see if the results were any different than the normal form (See Table II). This regression is more significant than the original and also included many statistically significant independent variables. The coefficients represented percent changes in the dependent variable given the percent change in the independent variable.

The Glesjer Test (Gujarati, 2006, 404) revealed that heteroscedasticity existed in the GDPpC variable. To correct for this all of the variables were divided by the square root of GDPpC. The new regression yielded a much higher r-squared, more significant F, and more significant t-statistics for the independent variables.

The best regression was restricted to four of the most significant variables (GDPpC, IU, IMMU, EX) to yield a better fit (Table II). The F statistic associated with restricting the regression was 0.88223 with 4 and 88 degrees of freedom. This F statistic was not significant at the 10% level, meaning that there was no significant change in the unrestricted versus the restricted regression. Therefore, the restricted regression is preferred.

The restricted regression yielded the following equation of the determinants of U.S. foreign aid in 2003:

$$\ln AID = 5.374 - 1.982 \ln GDPpC + .380 \ln IU + 1.233 \ln IMMU + 0.358 \ln EX$$

The coefficient for GDPpC was, as expected, negative. This means that as GDPpC increased the total amount of aid decreased. The coefficient for EX was positive, as expected, since many countries had "aid-for-trade" treaties. This means that the more a country imported from the U.S. the more aid they received. This raised several questions with respect to the equity

Table II: Determinants of U.S. Foreign AID 2003
(t statistic in parentheses)

Explanatory Variables	Normal Form	Log-Linear Form Unrestricted	Corrected Log-Linear Restricted
GDPpC	-14607.8 (-0.95895)	-0.938724538*** (-1.85264)	-1.981835268* (-3.79139)
IU	1.48E+15 (0.048989)	0.406792861 (1.461137)	0.380482757** (2.39915)
CO2	-0.453761854 (-1.1098)	-0.069754451 (-1.20874)	
IMMU	192596.1773 (0.13558)	1.400088877*** (1.782164)	1.232890996*** (1.867589)
POP	-1.47918E+13 (-0.04899)		
AGRI	33.04979135 (0.428311)	0.154365982 (1.088042)	
IMP	0.004638742 (0.589193)	-0.078833545 (-0.69279)	
EX	-0.005221558 (-0.48526)	0.383763465** (2.407399)	0.358268863* (2.768429)
Adj-R^2	-0.026169505	0.448442551	0.704239928
F	0.69078671	10.75657317*	58.14685619*
N	98	97	97
*significant at 1%	**significant at 5%	***significant at 10%	

of U.S. foreign aid since the poorest countries may not be able to import expensive American products.

The coefficients of IU and IMMU were unexpectedly positive. We thought it made more sense to give aid to countries with poor healthcare systems and that are not technologically advanced, rather than to those with good healthcare and more technology. This is not what we found. A possible explanation is that this effect is due to a trend of aid over time. If a country received aid in the past, that aid may be used to improve healthcare and information infrastructure. Aid may be offered to those countries in the future since they utilized it well. This would account for the positive coefficients associated with these variables.

This model does not account for the entire variation in aid from country to country. For future research, it may be beneficial to investigate other possible independent variables. To study the amount of aid given to countries in the past and how it may affect current and future aid would be interesting. Another area of interest may be to study the effectiveness of aid to receiving countries and how that may affect future aid.

Another possible determinant of aid that was not examined is the diplomatic status of the countries that received aid. If this could be quantified, then it may give insight into how the U.S. uses aid as a political tool. It would also be good to include nonmonetary aid such as food/medical aid to create a clearer picture of total aid the U.S. gives to other countries.

The "aid-for-trade" programs also merit future research since they seem to be export subsidies in disguise. Countries may choose to import American products only because they receive the aid which in essence reduces the price of the U.S. imports. Is the U.S. using aid as a means to bolster its exporting business? All of these would be useful in future analysis of U.S. and global foreign aid to see how other countries use or abuse their foreign aid.

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