

The Differential Effect of Governance on Aid to the Water/Sanitation and Health Sectors: An Analysis

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April 20, 2012

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EXECUTIVE SUMMARY

Policy Question

A swathe of research attests to the importance of governance in achieving economic growth and poverty reduction in developing countries. Whether governance has an equal effect across sectors, however, is a question that has been neglected empirically. This study adds to the literature by examining the differential impacts of governance on aid to the water/sanitation and health sectors.

Methodology

I used Ordinary Least Squares (OLS) to estimate the effect of health aid and water/sanitation aid on immunization rates and access to improved water and sanitation sources, respectively. My data on aid is from the OECD; I collected annual data for 5 aid flows: health aid, basic health aid, water/sanitation aid, water aid for large projects and sanitation aid for large projects, from 1996 to 2009. Annual data on immunization rates from 1990 to 2009 were collected from the World Bank World Development Indicators, and data on access to an improved water source and access to improved sanitation were collected from the WHO; 5 data points were available on this indicator. My covariates include governance, civil war, GDP per capita, GDP growth (percentage), decentralization, an indicator variable for Africa and log of population, which is consistent with the literature.

Results

I found that governance had a statistically significant impact on aid to the water and sanitation sectors—the sanitation sector appeared to be most negatively affected by poor governance—and no impact on aid to the health sector. These findings have potential implications for donor funding; they provide evidence that governance does not have an equal effect across sectors and that sector-level analysis of governance conditions in countries is important to undertake before giving aid. This study could also support increased aid to the water sector, as donor fears that aid will be squandered in the sector could be assuaged with these findings and the findings of other studies that (hopefully) will follow, which show that aid could be increased where good governance warrants it. While the water/sanitation sector is the subject of multiple Millennium Development Goal (MDG) targets and indicators, making it more of a donor priority than many other sectors, like production or civil society, for example, the proportion of Official Development Assistance (ODA) to the water/sanitation sector has actually decreased since 2000, when the MDGs were initiated.

INTRODUCTION

A swathe of research attests to the importance of governance in achieving economic growth and poverty reduction in developing countries. Whether governance has an equal effect across sectors, however, is a question that has been neglected empirically. This study adds to the literature by examining the differential impacts of governance on aid to the water/sanitation and health sectors.

In addition, this study investigates the reasons for differential governance impacts by testing the findings of a recent paper by Simone Dietrich (2011) on aid effectiveness to the health sector. This study showed that countries with lower corruption control have improved immunization coverage over time.ⁱ Dietrich's hypothesis is that corrupt countries spare sectors like health that rank high on donor priorities and in which compliance with donor objectives is cheap, from rent seeking. If this hypothesis is correct, it could have definite implications for the water/sanitation sector. This sector at least partly meets Dietrich's conditions for reduced rent seeking—one target of the Millennium Development Goals (MDGs) is explicitly related to the water/sanitation sector: "Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation," and there is little doubt that donors have concentrated their attention on sectors that are covered by the MDGs. As Manning writes, "Undoubtedly, the proportion of aid going to the productive sector (not directly covered by the MDGs) has fallen, and the proportion to social sectors (well-covered by the MDGs) has risen."ⁱⁱ

However, Dietrich's other criterion—that compliance with donor goals for the sector be cheap—does not appear to be met by the water/sanitation sector. By "cheap" Dietrich means the sector lacks many opportunities for rent seeking. Dietrich posited that the health sector met this criterion because aid to the sector is often funneled to small scale projects that are supported by NGOs and donors. This cannot be said about the water/sanitation sector, which is usually much more centralized.ⁱⁱⁱ

If, despite only partially meeting Dietrich's criteria, the water/sanitation sector is found to be unaffected by poor governance, then a reassessment of donor strategies to the sector would likely be needed. Currently, the sector is affected greatly by donor perceptions of poor governance—a recent UN Water report shows that less than half of current water and sanitation aid is received by the lowest income countries.^{iv} In response to this statistic, Chief of Water, Sanitation, and Hygiene for UNICEF, Clarissa Brocklehurst, explained that the "countries that are most in need are the most difficult to invest in."^v

LITERATURE REVIEW

Literature on Foreign Aid to the Health Sector

As the development agenda has turned to measuring outcomes that align with poverty reduction and achievement of the MDGs, more studies have come to proxy aid effectiveness with development outcomes in health or education, not economic growth, which was the dominant proxy studies used in the past.^{1vi} These outcomes include infant mortality and life expectancy^{vii}; quality of life^{viii}; and poverty reduction^{ix}. These studies have, like the literature on total aid effectiveness, shown mixed results. Boone (1995) and Masud and Yontcheva (2005), for example, showed that bilateral aid did not have statistically significant impacts on their outcomes of interest: infant mortality, primary schooling ratios, and life expectancy, in the case of Boone, and poverty reduction, proxied by infant mortality rate and adult illiteracy, in the case of Masud and Yontcheva.

Studies have recently begun to use these kinds of outcomes—infant mortality rate and life expectancy, for example—to evaluate aid in specific sectors, like education or health.^x These narrower goals have definite advantages—the causal pathways for aid effectiveness in a sector are less complex, so the impact of aid is easier to discern—and defend. The relatively small number of these studies in the literature appears to be due most to data limitations; enough time series sector-level data has only been available for study in recent years.

Empirical studies on the impact of aid on the health sector, specifically, include the Dietrich already discussed, Gebhard et. al (2008), Mishra and Newhouse (2009) and Susana Wolf (2007). Gebhard et. al looked at the effect of bilateral and multilateral aid on long-term health outcomes in recipient countries—infant and child mortality and life expectancy—using data from the Project-Level Aid Database from 1975 to 2000.^{xi} They found that health aid did not lead to improved health outcomes in countries. Mishra and Newhouse also examined the relationship between health aid and infant mortality rate, using a wider data set, from 1973 to 2004.^{xii} They found that health aid has a beneficial and statistically significant impact on health; doubling per capita health aid is associated with a 2 percent reduction in the infant mortality rate.

Wolf examined not only aid to the health sector, but education, water and sanitation sectors. Her paper analyzed the impact of this aid on education outcomes (completion of primary education and youth literacy), health (infant and child mortality rates), and water and sanitation outcomes (improved exposure to water and sanitation), respectively. She employed a simultaneous equation model and found that aid to the water and sanitation sector appears to be ineffective, though aid volatility is associated with better outcomes. Aid to education and health seems to have a positive impact on outcomes in these sectors. Total aid seems to be negatively associated.^{xiii}

¹ See Appendix B for background on aid effectiveness literature.

Previous Literature on Foreign Aid to the Water and Sanitation Sector

Only two studies were found that analyzed water and sanitation outcomes on a cross-country basis using empirical methods.² The first, Wolf's, was mentioned above. The second is from Botting et. al.^{xiv} This study looked at correlations between official development assistance (ODA) for the water and sanitation sector and infant and child mortality, since 2002. Botting et. al also found that access to improved water has consistently improved, and that those countries that received more aid, had more access to improved water. Sanitation outcomes were not significant.

Hypothesis:

My study investigates the following research question:

How does governance affect aid to the water/sanitation and health sectors?

My hypothesis is that governance has a greater effect on aid to the water/sanitation sector—particularly on the impact of water aid for large projects and sanitation aid for large projects—than the health sector. As I stated earlier, projects in the water/sanitation sector are more centralized (particularly aid for large projects) and thus, more susceptible to government corruption. The water/sanitation sector also does not meet all of Dietrich's criteria for a reduced rent-seeking sector. As a result, I expect that aid to the water/sanitation sector, water aid for large projects and sanitation aid for large projects will have an insignificant impact on access to improved water and sanitation in countries with poor governance. Across countries, as governance improves, I hypothesize, so does the effectiveness of aid.

In the health sector, I hypothesize that governance has less of an impact on aid effectiveness. In addition, if Dietrich's hypothesis is correct, countries with poor governance have a particular incentive to lessen its impact on aid to the health sector. I thus expect health aid to have a positive, statistically significant impact on immunization coverage regardless of poor governance.

My examination of the impact of health aid and water/sanitation aid on health and water sanitation outcomes goes beyond Wolf and Dietrich's studies in several ways. Wolf's study was cross-sectional, whereas my study includes developing countries with data from 1996 to 2009. A panel data set allows me to observe trends in countries over time (and provides more evidence to support a causal relationship between aid and my outcomes). It also allows me to rule out confounding factors that influence aid effectiveness, like factors specific to each country (controlled with fixed effects in panel data), making my results more robust. My study is also

² There are few studies on the impact of foreign aid to the water and sanitation sector. This is most likely due to the scarcity of good data on cross-country indicators in this sector. For example, while UNICEF collects data on the percentage of children with fever receiving malaria medication and the percentage of children with diarrhea receiving oral rehydration or other treatment, the data on these indicators for each country are often from different years; this makes them difficult to analyze. Another example is the WHO Burden of Disease study; while it reported data on water/sanitation outcomes from 2004 and 2008, data methodology changes between these years have made the data incomparable.

different from Wolf's because she used more long-term variables to proxy for aid effectiveness in the health sector—infant mortality rates and child mortality rates—which makes the causal case for aid harder to establish, as many more factors could influence these outcomes than immunization rates. My study also goes beyond Dietrich's, by examining the effect of both health *and* water/sanitation aid. In addition, unlike Wolf or Dietrich, I used more specific aid flows in my analysis, like basic health aid and water aid for large projects, to more closely approximate the impact of aid.

DATA

To understand the effect of water/sanitation aid and health aid on water/sanitation and health outcomes, respectively, I use Ordinary Least-Squares (OLS) model. My dataset contains 146 countries—those countries that the OECD reports as receiving commitments for ODA from 1995 to 2010. Only independent countries were included in this dataset, as data on dependent territories is more scarce (so those territories would likely drop out of the analysis, had they been included) and the support of a proprietor country makes isolating the effect of aid difficult.

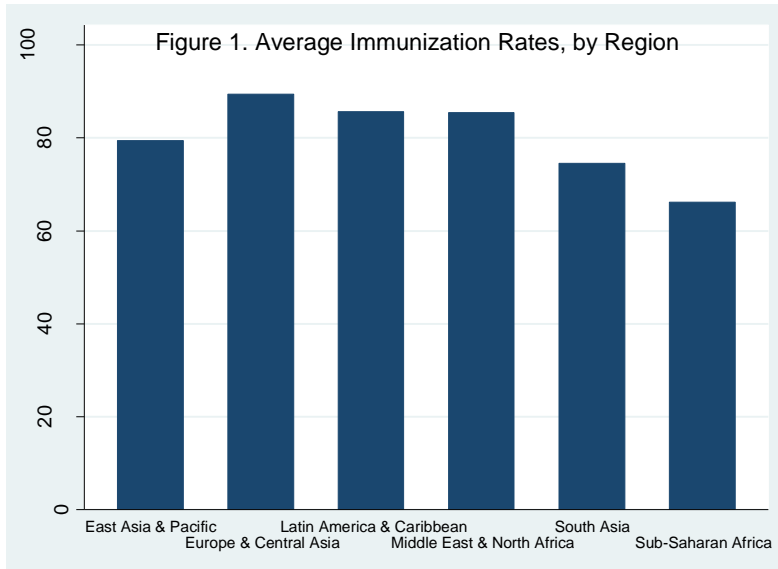
Outcome Variables

Health Aid Effectiveness

To proxy for the effectiveness of health aid, I am using the percentage of Diphtheria tetanus toxoid and pertussis (DTP3) immunization coverage among 1-year-olds, an indicator from the WHO. I have annual data on this indicator from 1990 to 2009. Figure 1 shows the distribution of immunization rates for countries in the dataset, by region. I'm logging this variable so that it more closely approximates a normal distribution. I also accounted for ceiling effects—that countries with already high immunization rates didn't have as much room to improve on immunization rates over time as others—by including the immunization rates of countries in 1985.³ See Appendix C for a map of the current DTP3 coverage worldwide.

DTP3 coverage is considered a good indicator of a health system's performance because it involves repeated service delivery—three doses of DTP vaccine is required to fully immunize children.^{xv} It's also a good indicator of aid effectiveness because, while governments become increasingly involved in the provision of immunizations as countries become richer,^{xvi} donors have historically been the main drivers in increased immunization coverage, from 20 percent coverage of infants in 1980 to 79 percent in 2006.^{xvii}

³ I attempted to use a convergence factor to control for ceiling effects (the immunization rate for countries in 1985) but the convergence factor was too highly correlated with the dependent variable (see Appendix E). I also tried differencing by 5 years, but the models' F-statistic became insignificant when this was used.

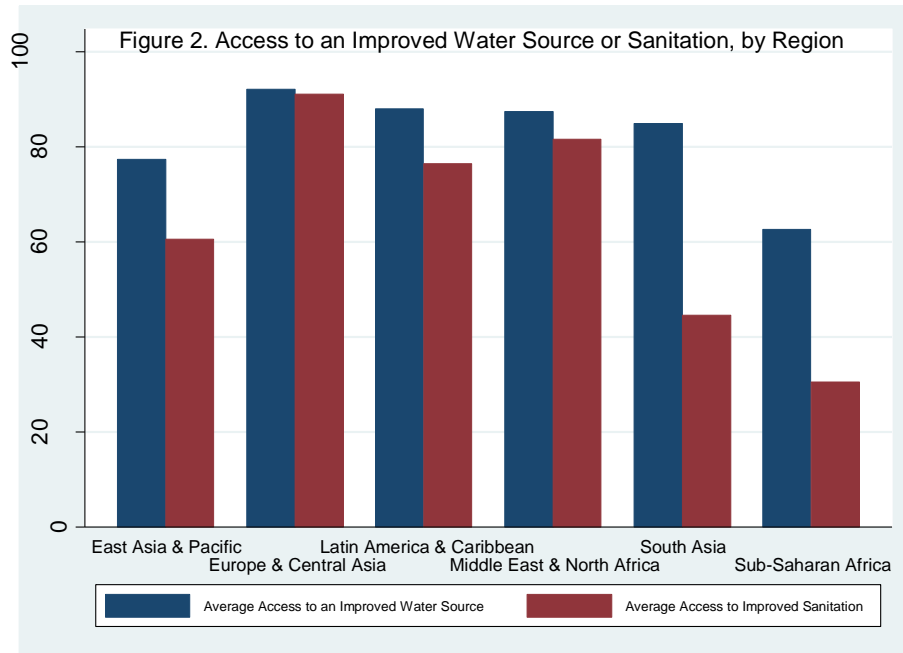


Water/Sanitation Aid Effectiveness

My other outcomes of interest are related to aid effectiveness to the water/sanitation sector: the percentage of population with access to an improved drinking water source and the percentage of the population with access to improved sanitation facilities. The data are from the WHO, and are measured irregularly—5 data points between 1990 and 2008—but for a comprehensive list of countries. Improved drinking water sources refer to the technology that enables access to safe water, including “household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collections... Reasonable access is broadly defined as the availability of at least 20 liters per person per day from a source within one kilometer of the user’s dwelling.”^{xxviii} Figure 2 shows the distribution of countries’ access to an improved water source. 1.1 billion people lack an improved source of water.^{xix}

Sanitation refers to “the percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta.”^{xx} Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection.^{xxi} More than double the number of people that don’t have access to an improved water source don’t have access to improved sanitation—2.6 billion people (see Figure 2).^{xxii} See Appendix D for maps of current water and sanitation access worldwide.

These indicators for water/sanitation aid effectiveness are considered good measures for aid effectiveness because they are MDG indicators—and, as previously discussed, donors often concentrate their efforts around MDG targets.



Independent Variables of Interest

My data on health aid and total water/sanitation aid are from the 23 members of the OECD's Development Assistance Committee (DAC), as well as those of multilateral development banks and some UN agencies. I also used data on water aid for large projects, sanitation aid for large projects and basic health aid, which is aid for basic health interventions like vaccines and immunizations; this aid was targeted at more specific outcomes and I thought it would help explain how aid was effective and aid to the robustness of my findings. Since aid data on commitments and disbursements of these donors were similar, and data for some countries on disbursements was not as widely available, I used data on aid commitments reported to the Creditor Reporting System (CRS). This is consistent with the literature. These numbers are in constant 2009 USD. Aid for each country was converted into a rolling five year sum and logged. This accounts for the often delayed impact of aid on the outcomes of interest, and helps to normalize the variables' distributions.

Covariates

Consistent with the literature, I will be using a variety of covariates believed to influence the effectiveness of aid, including governance, decentralization, prior immunization rate, an indicator variable for countries in Africa, and demographic characteristics. I will not be including health expenditures, literacy rate, or democracy; while these variables have also appeared frequently in other studies, literacy rate and democracy were highly correlated with other variables and the relative lack of data available on health expenditures or literacy rate decreased my sample size greatly when included (see Appendix F for pairwise correlations on the variables in this study).

My data on governance are from the World Bank’s World Governance Indicators (WGI) from 1996 to the present. These indicators: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption measure governance on a scale of -2.5 (weak governance) to 2.5 (strong governance).^{xxiii} Because they are highly correlated with one another, I will be using an average of 5 indicators—all but voice and accountability, which is accounted for by Polity IV data. I include interaction terms between governance and aid, to test my hypothesis that the effect of aid is conditional on governance quality.

The variable used for decentralization is from the updated World Bank Database of Political Institutions.^{xxiv} If state/province governments are reported as locally elected, the indicator takes one of three values: “0” if no decentralization, “1” if some decentralization and “2” if decentralization.

My data on demographics are from the UNDP—log of population—and World Bank—GDP per capita and GDP per capita growth (to proxy for economic growth). I also include a variable on war presence, lagged one year, from the PRIO Dataset on Armed Conflict.^{xxv} Countries are coded with 1 if they have a type 3 or 4 conflict, which refers to civil war.

I’m also using a dummy variable for countries in Africa, to help account for regional differences in aid levels.

Descriptive statistics are listed in Table 1, below. (See Appendix F for a list of variables and their sources).

Table 1. Descriptive Statistics

| Variable | N | Mean | Std. Dev. | Min | Max |
|-----------------------------------|------|----------|-----------|----------|----------|
| Outcomes of Interest | | | | | |
| Access to Improved Sanitation | 622 | 59.67042 | 30.81897 | 4 | 100 |
| Access to Improved Water Source | 630 | 78.22381 | 18.95822 | 17 | 100 |
| Immunization Rates | 2895 | 78.2494 | 20.2868 | 2 | 99 |
| Indicators of Interest* | | | | | |
| Total Water/Sanit Aid | 3139 | 7.929838 | 8.786934 | 0 | 22.0321 |
| Total Health Aid | 3139 | 8.239279 | 8.851532 | 0 | 21.76061 |
| Basic Health Aid | 3139 | 7.645831 | 8.478221 | 0 | 21.40281 |
| Water Aid for Large Projects | 3139 | 6.839197 | 8.26398 | 0 | 21.62927 |
| Sanitation Aid for Large Projects | 3139 | 0.588737 | 3.000108 | 0 | 18.89739 |
| Covariates | | | | | |
| Immunization Rate in 1985 | 3139 | 52.38324 | 27.77938 | 2 | 99 |
| Governance | 3095 | -0.39119 | 0.695743 | -2.60212 | 1.9195 |
| Log of GDP per capita | 2967 | 7.071293 | 1.275101 | 4.060443 | 10.48417 |
| GDP Growth | 2974 | 2.020847 | 7.183546 | -50 | 148 |
| War | 3139 | 0.147499 | 0.354659 | 0 | 1 |
| Decentralization | 1990 | 0.627136 | 0.758175 | 0 | 2 |
| Africa | 3139 | 0.322396 | 0.467468 | 0 | 1 |
| Log of Population | 2990 | 15.33948 | 2.095515 | 9.621721 | 20.98563 |

*All aid is summed over five years, logged and lagged (2 years for health aid, 5 years for water/sanitation aid).

METHODOLOGY

I will run OLS regressions on each of my outcomes.

$Y = \beta_0 + \beta_1 * \text{sector-specific aid} + \beta_2 * \text{controls} + \varepsilon$, where ε is the error term

Panel indicators: Y= improved access to water source

Y= improved access to sanitation facility

Y= immunization rates

I attempt to make my results more robust by accounting for the variability of error around my variables (the heteroskedasticity of their error terms), clustering the standard errors by country (since the error terms on data points from the same country over time are correlated) and using country fixed effects, which controlled for all the factors within a country that could drive my results. I also tried to control for changes over time that could affect my results with my choice of covariates; however, omitted variable bias is still a threat.⁴

The largest threat to the validity of my study, however, is the endogeneity of aid. The reason this endogeneity is an issue is that including aid in a standard OLS regression measuring aid's effectiveness violates a key assumption of OLS—that independent variables are uncorrelated with the error terms. This can lead to skewed, misleading estimates of aid's effectiveness. Most studies try to account for endogeneity by using instrumental variables in a Two Stage Least Squares (2SLS) model or General Methods of Movements (GMM) model. Unfortunately, however, “gold standard” instruments to use for aid endogeneity don't exist.^{xxvi} Among the most common instruments are countries' former colonial status; this is believed to affect aid levels, as former colonists are assumed to show a preference giving aid to the countries they once colonized. It assumes that colonial status is exogenous to the dependent variable on aid effectiveness; this is a dubious conclusion. As several studies have pointed out, colonial status is external, but may not be exogenous; countries' development was influenced by their colonial heritage—a country's infrastructure, for example, is often a reflection of the colonizer, and it's reasonable to assume that the quality of infrastructure can affect aid. Thus, colonial status has problems as an instrument.^{xxvii}

⁴ I could not use first differences to address a potential problem with omitted variables because the data on dependent variables for water/sanitation were not annual or from consistent time periods (like every five years).

Validity Concerns

Data

Beyond aid's endogeneity, omission of data is the largest factor that could affect the validity of my study. Non-DAC countries like China, NGOs and international organizations like the Bill and Melinda Gates Foundation, do not report their aid to the OECD. These countries and organizations spend millions on global health each year; China, for example, began giving bilateral aid in 2005—and its contributions are “particularly important for the water sector because of China's strong history of infrastructure investment.”^{xxviii} In addition, funds from the Global Alliance for Vaccinations and Immunizations (GAVI), an organization that obviously contributes a significant amount of funds to increase immunizations, is not included in OECD data.^{xxix}

Thus, this study, which only uses OECD reported data, is under-estimating the amount of aid to the health and water/sanitation sector and, potentially, its effect.

FINDINGS

Immunization Rates and Aid

Health aid and basic health aid have a positive, statistically significant impact on the log of immunization rates.⁵ As basic health aid increases by 1 percent, the log of immunization rates increases by .007 percent (see Table 2, Model 1). This finding supports my hypothesis that aid to the health sector has a statistically significant impact. Basic health aid appears to be more effective than health aid, in general, on log of immunization rates; this was expected, as this aid is more targeted to the outcome of interest.

Africa, prior immunization rate and governance are the only variables that appeared to have a significant effect on log of immunization rate, and they had the expected signs. As governance increases by one unit, the log of immunization rates increases by approximately 12 percent, for both basic health aid and health aid. Governance appears to have an impact on immunization coverage, but not on aid to accomplish this outcome; the interaction terms between

⁵ Each time I regressed an aid flow on an outcome of interest, I ran 6 model specifications. First, I included only the dependent and independent variables of interest; the next two model specifications included various combinations of control variables—demographic and governance controls. The fourth model included all controls; the fifth included all controls and an interaction term on governance, and the sixth included all controls, an interaction term and fixed effects. All models are robust and cluster errors by country—except model 6, which included fixed effects.

Most of the variation that affects my outcomes of interest appears to be across countries, not within them (and fixed effects appear to usually wipe out the cross-country effect). Because of this, and the fact that the R-squared for models 4 and 5 (with and without an interaction term on governance) are the largest, I display results for only models 4 and 5 and limit my discussion to these models' findings.

governance and health aid and basic health aid, respectively, are insignificant. This finding supports my hypothesis that governance does not have a large impact on aid effectiveness in the health sector. Health aid appears to have a positive effect in both well-governed and poorly governed countries.

Table 2. Effect of Health Aid and Basic Health Aid on Log of Immunization Rates

| Variables | Basic Health Aid | | Health Aid | |
|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | (1) | (2) | (3) | (4) |
| Log of Aid | 0.00714*** (0.00116) | 0.00556*** (0.00109) | 0.00662*** (0.00109) | 0.00508*** (0.00101) |
| Immunization Rate in 1985 | 0.00355*** (0.000912) | 0.00302*** (0.000873) | 0.00354*** (0.000912) | 0.00299*** (0.000876) |
| Log of Population | 0.00261 (0.0109) | 0.00467 (0.0101) | 0.00327 (0.0110) | 0.00621 (0.00999) |
| Log of GDP per capita | -0.00533 (0.0193) | -0.0207 (0.0203) | -0.00583 (0.0193) | -0.0221 (0.0204) |
| GDP Growth (%) | -0.000705 (0.00113) | -0.000536 (0.00104) | -0.000711 (0.00113) | -0.000540 (0.00104) |
| Decentralization | 0.00192 (0.0197) | -0.000402 (0.0192) | 0.00143 (0.0198) | -0.00115 (0.0194) |
| Presence of War | -0.0792 (0.0567) | -0.0541 (0.0581) | -0.0797 (0.0568) | -0.0554 (0.0571) |
| Governance | 0.120*** (0.0342) | 0.132*** (0.0345) | 0.118*** (0.0341) | 0.130*** (0.0343) |
| Africa | -0.162*** (0.0553) | -0.178*** (0.0565) | -0.162*** (0.0553) | -0.179*** (0.0566) |
| Log of Aid*Governance | | 2.85e-10 (4.50e-10) | | 2.66e-10 (3.38e-10) |
| Constant | 4.210*** (0.258) | 4.349*** (0.251) | 4.204*** (0.259) | 4.339*** (0.252) |
| Observations | 1,802 | 1,370 | 1,802 | 1,370 |
| R-squared | 0.411 | 0.400 | 0.409 | 0.399 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Water Access and Aid

Water/sanitation aid had a positive impact of .360 and .390 units on access to improved sanitation and an improved water source, respectively; these findings were significant at the 1 percent level in models controlling for all covariates and clustering robust standard errors (see Table 3). That aid to the water and sanitation sector appears to be more effective on both water and sanitation outcomes of interest than aid to the health sector is surprising.

Governance had an impact on water/sanitation aid effectiveness; coefficients on the interaction terms on regressions for both access to improved sanitation and an improved water source, 1.336 and .408, respectively, were statistically significant at the 1 percent and 10 percent levels. That governance appears to have such a strong impact on aid to the sanitation sector is unsurprising, given governance concerns in the sector that were previously mentioned. These findings confirm my hypothesis that poor governance has a significant impact on the water/sanitation sector; however, it does not show an insignificant impact on access to improved water and sanitation as a result.

Table 3. Effect of Water/Sanitation Aid on Improved Access to Water and Sanitation Sources

| Variables | Sanitation | | Water | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| Log of Water/Sanitation | 0.360*** (0.0816) | -0.618** (0.307) | 0.390*** (0.0517) | 0.392 (0.261) |
| Log of Population | -1.012 (0.915) | 0.168 (1.047) | -0.612 (0.605) | -0.666 (0.695) |
| Log of GDP per capita | 11.84*** (2.299) | 8.691*** (2.670) | 7.600*** (1.260) | 6.898*** (1.392) |
| GDP Growth (%) | -0.0359 (0.214) | 0.0256 (0.256) | -0.0759 (0.133) | -0.0126 (0.154) |
| Decentralization | -2.209 (2.033) | -2.468 (2.199) | -0.180 (1.316) | -0.255 (1.441) |
| Presence of War | -2.033 (3.422) | -0.963 (4.212) | -0.543 (2.254) | 1.047 (2.754) |
| Governance | 3.919 (3.232) | -12.58*** (3.471) | 1.471 (2.076) | -3.199 (4.320) |
| Africa | -22.84*** (5.065) | -26.30*** (5.229) | -9.481*** (3.112) | -9.599*** (3.025) |
| Water/Sanitation Aid*Governance | | 1.336*** (0.245) | | 0.408* (0.244) |
| Constant | -0.841 (25.19) | 23.94 (29.69) | 35.42** (14.57) | 42.01*** (15.17) |
| Observations | 418 | 262 | 423 | 264 |
| R-squared | 0.677 | 0.702 | 0.581 | 0.566 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1, *'p<.15, **'p<.17

Water Access and Aid for Large Projects

Water aid for large projects appeared to affect access to an improved water source; as the log of water aid for large projects increased by 1 percent, access to an improved water source increased by .364 units, significant at the 1 percent level. The interaction term between water aid for large projects and governance also had an impact; the coefficient on the interaction term was .481, significant at the 5 percent level. The finding that governance had a larger impact on aid to large water projects than aid to the water/sanitation sector as a whole was expected; large water projects are more centralized and require more government involvement. Thus, poor governance is more likely to have an effect on these types of projects.

Table 4. Impact of Log of Water Aid for Large Projects and Log of Sanitation Aid for Large Projects Lagged 5 Years, on Access to an Improved Water Source

| Variables | Water Aid for Large Projects | | Sanitation Aid For Large Projects | |
|-------------------------------|------------------------------|----------------------|-----------------------------------|----------------------|
| | | | | |
| Log of Aid for Large Projects | 0.364*** (0.0652) | 0.234* (0.160) | 0.0715 (0.362) | 0.407 (0.634) |
| Log of Population | -0.691 (0.604) | -0.573 (0.624) | -0.768 (0.917) | -0.810 (1.038) |
| Log of GDP per capita | 7.516*** (1.261) | 6.536*** (1.398) | 11.37*** (2.222) | 10.20*** (2.556) |
| GDP Growth (%) | -0.0758 (0.134) | -0.000451 (0.152) | -0.0135 (0.209) | 0.0780 (0.281) |
| Decentralization | -0.0679 (1.339) | -0.193 (1.423) | -2.000 (2.033) | -1.434 (2.317) |
| Presence of War | -0.678 (2.273) | 1.076 (2.745) | -3.270 (3.426) | -2.461 (4.343) |
| Governance | 1.373 (2.100) | -2.798 (3.369) | 3.720 (3.127) | 4.455 (3.231) |
| Aid*Governance | | 0.481** (0.192) | | 0.871 (0.935) |
| Africa | -9.650*** (3.109) | -9.948*** (2.997) | -23.02*** (5.026) | -26.65*** (5.592) |
| Constant | 37.96** (14.73) | 46.59*** (14.92) | 2.333 (25.07) | 15.20 (29.39) |
| Observations | 423 | 264 | 418 | 262 |
| R-squared | 0.573 | 0.567 | 0.667 | 0.671 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1, *p<.15

DISCUSSION

This study did not find, as Dietrich’s did, that immunization rates improved in corrupt countries, which suggests that her finding is not robust to different data sets and model specifications. It did find evidence that governance does not greatly influence the effectiveness of aid to the health sector. The sanitation sector appears to be most negatively affected by poor governance. These findings support my hypothesis that the effects of governance differ by sector, which has potential implications for the water/sanitation sector.

While the water/sanitation sector is the subject of multiple MDG targets and indicators, making it more of a donor priority than many other sectors, like production or civil society, for example, the proportion of Official Development Assistance (ODA) to the water/sanitation sector has actually decreased since 2000, when the MDGs were initiated (see Appendix A). The sanitation sector, in particular, has been facing aid shortfalls. As a result, it is likely that “efforts to halve the number of those without adequate sanitation by 2015 will come up one billion people short” according to the UN.^{xxx} Aid to the sector would have to be almost doubled to meet the goal.^{xxxi}

This study could also support increased aid to the water sector, as donor fears that aid will be squandered in the sector could be assuaged with these findings and the findings of other

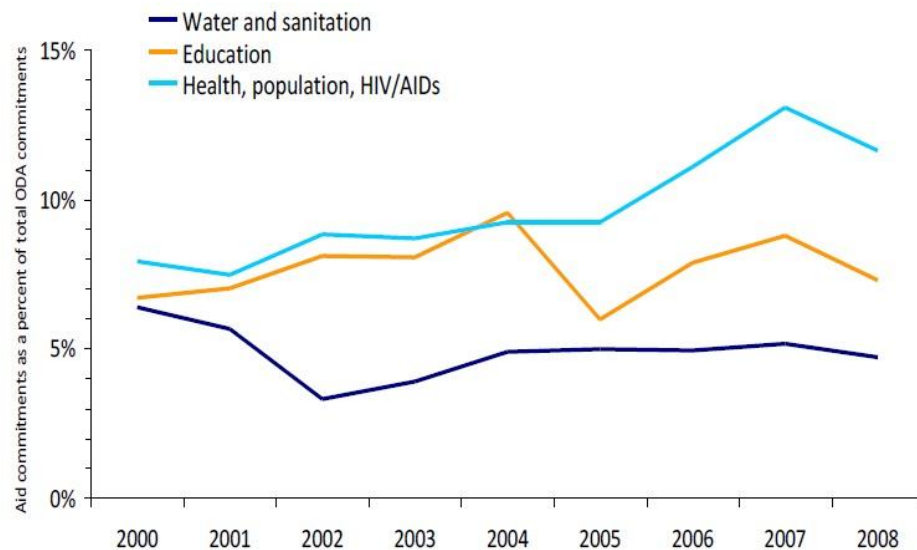
studies that (hopefully) will follow, which show that aid could be increased where good governance warrants it.

However, increasing aid is just one step the donor community needs to take to improve access to water and sanitation in developing countries. This study showed a lack of macro-level studies on aid effectiveness to the water/sanitation sector; this is matched by a dearth of studies estimating the impacts of micro-level water/sanitation interventions financed by donors. For example, a recent meta-analysis on interventions to reduce diarrhea incidence found only 46 studies that contained relevant evidence.^{xxxii} Another meta-analysis looking at environmental health interventions that aimed to increase household uptake of taps or toilets, or to change households' water source found only 15 studies that matched the criteria for inclusion.^{xxxiii}

The water/sanitation sector needs a broader evidence base for interventions to increase their effectiveness. More evaluations on water/sanitation projects will also improve the sector's accountability—which will hopefully have an impact on the sanitation sector, where governance appears to be more of an issue; evaluations show governments that the sector is a priority and that outcomes are being rigorously monitored.

Finally, to be effective, water/sanitation aid projects must also be sustainable, and their sustainability should be proven empirically. As Moe writes, “Technical sustainability has been an ongoing problem in water and sanitation projects in developing countries. Too often, a pump or other piece of equipment breaks and cannot be repaired. This problem can occur all along the scale of services from a pump at a borehole to a pump in a modern water or wastewater treatment plant.”^{xxxiv} A major way to increase this sustainability is to fund demand-driven projects, with buy-in from local communities. This is important to increase uptake and continued use of interventions like household latrines—interventions that are dependent on behavior change to improve health outcomes.

APPENDIX A



Source: GLAAS report, 2010

APPENDIX B

Background on Foreign Aid Effectiveness

Official development assistance (ODA) from DAC countries to developing countries has risen more or less steadily over the past 50 years. In 2010, the OECD Development Assistance Committee (DAC) reports that aid amounted to 129 billion dollars, the largest amount in history.^{xxxv} What has been the effect of all this aid? This is surprisingly unclear. While aid on the micro level, to project and programs, has generally been shown to have a positive impact,^{xxxvi} the macro, or country-level, is different; the results of aid effectiveness are much less conclusive. The first study to note this “micro-macro” divide was Mosley (1986), who showed that, while most World Bank projects reported positive results from aid, the effect of this aid on the country level could not be observed.^{xxxvii}

Since drawing a macroeconomic conclusion from microeconomic data is problematic, and, as Collier (2002) argues, “project-level performance is an inadequate instrument for attaining donor objectives,”^{xxxviii} economists and policy-makers have continued to seek definitive evidence on the macro level on whether aid is effective. Mosley and many others—97 papers by the end of 2004—used economic growth to proxy for aid effectiveness and ran cross-country regressions to test the effect of aid.^{xxxix} Studies also tried to establish whether aid is effective under certain conditions. A famous example of this is Burnside and Dollar’s study, which showed that aid, conditional on economic policy, increased growth.^{xl} Other studies investigated whether short-term economic aid affected growth^{xli}, whether aid effectiveness was conditional on good governance,^{xlii} whether aid was more effective in democracies,^{xliii} whether aid is more effective in less conflict-ridden countries^{xliv} and whether aid was more effective in countries with certain climates.^{xliv}

However, many studies reporting an impact of aid on economic growth have been challenged and seriously undermined. These studies are often sensitive to the dataset used, model specifications and econometric techniques. Dalggaard and Hansen^{xlvi} and then Easterly, Levine and Roodman,^{xlvii} for example, have shown that Burnside and Dollar's analysis was sensitive to years of data employed. Rajan and Subramanian^{xlviii} refuted Clements, Radelet and Bhavnani's paper on short-term growth within a year of its publication. It is difficult to draw robust, lasting conclusions from studies using cross-country regressions.

No macroeconomic impact?

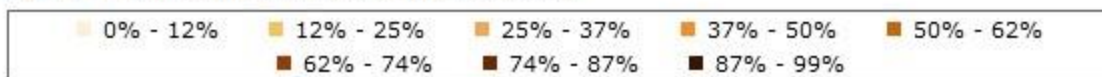
Beyond the difficulties posed by *how* to measure aid, proving aid effectiveness on the macro level is difficult for a number of reasons. Much aid is given at the micro level, and its effect on the national level within a country may not be visible on indicators like economic growth, which are affected by a multitude of factors. Aid is also given for a multitude of reasons, not just to increase economic growth; thus, measuring its impact with this proxy may not be indicative of aid's effectiveness.^{xliv}

There are also theories that a negative effect of aid on the macro level belies the positive effect of aid on the micro level, leaving no overall impact in macro-level regressions. For example, a large number of aid projects could strain a government's capabilities or lead to increased corruption in the country.¹ Studies which attempt to show aid's negative effect on the macro level, however, can suffer from the same problems as studies on the impact of aid on growth and often have conflicting results. For example, Ear critiqued a study that showed with regression analysis that aid weakens institutions, citing that such a link was sensitive to model specifications.ⁱⁱ

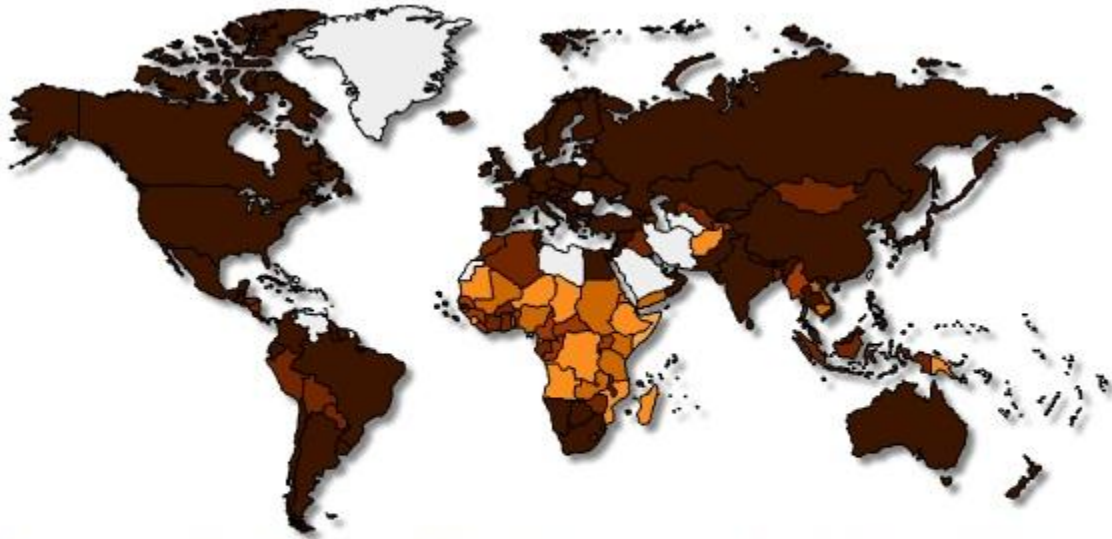
APPENDIX C



DTP3 Immunization Coverage, 2010 Source: WHO

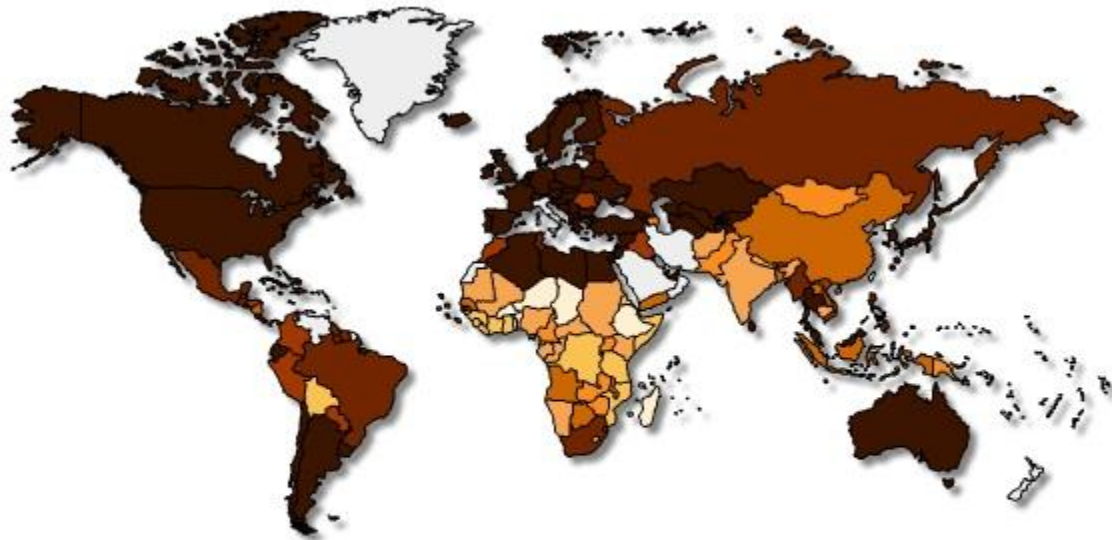
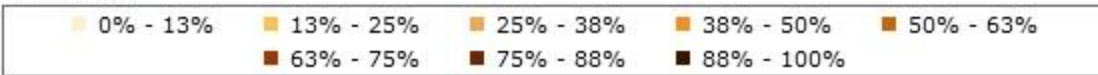


APPENDIX D

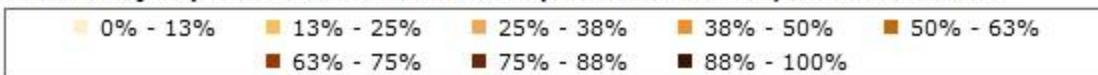


Percentage of Population with Access to an Improved Water Source, 2008

Source: WHO



Percent of Population with Access to Improved Sanitation, 2008 Source: WHO



APPENDIX E

. pwcorr gov5n_ polity2_ loggdppc_ gdpgrowth_ healthexp_ conflict_ state_n logpop_ adultlit_ Africa,sig

| | gov5n_ | polity2_ | loggdppc_ | gdpgror~_ | health~_ | confli~_ | state_n |
|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| gov5n_ | 1.0000 | | | | | | |
| polity2_ | 0.3639 0.0000 | 1.0000 | | | | | |
| loggdppc_ | 0.6909 0.0000 | 0.2852 0.0000 | 1.0000 | | | | |
| gdpgrowth_ | 0.0750 0.0000 | 0.0166 0.4094 | 0.0789 0.0000 | 1.0000 | | | |
| healthexp_ | 0.2447 0.0000 | 0.3296 0.0000 | 0.1071 0.0000 | -0.0718 0.0011 | 1.0000 | | |
| conflict_ | -0.2872 0.0000 | -0.0477 0.0153 | -0.2329 0.0000 | 0.0063 0.7299 | -0.0949 0.0000 | 1.0000 | |
| state_n | -0.0299 0.1833 | 0.1640 0.0000 | 0.0066 0.7722 | 0.0194 0.3975 | -0.0067 0.8086 | 0.0356 0.1119 | 1.0000 |
| logpop_ | -0.4009 0.0000 | -0.0326 0.1063 | -0.3262 0.0000 | 0.0350 0.0626 | -0.2429 0.0000 | 0.3379 0.0000 | 0.1812 0.0000 |
| adultlit_ | 0.3388 0.0000 | 0.2469 0.0000 | 0.6124 0.0000 | 0.0891 0.0065 | 0.1461 0.0002 | -0.2153 0.0000 | 0.1186 0.0021 |
| Africa | -0.2803 0.0000 | -0.1741 0.0000 | -0.5221 0.0000 | -0.0590 0.0013 | -0.1312 0.0000 | 0.0879 0.0000 | 0.0065 0.7733 |
| | | logpop_ | adultl~_ | Africa | | | |
| logpop_ | | 1.0000 | | | | | |
| adultlit_ | | -0.2240 0.0000 | 1.0000 | | | | |
| Africa | | 0.0581 0.0015 | -0.5414 0.0000 | 1.0000 | | | |

APPENDIX F

| Data | Source |
|---|--|
| Water/Sanitation Aid | CRS, OECD |
| Health Aid | CRS, OECD |
| Total Aid | CRS, OECD |
| Access to an Improved Water Source/Sanitation | WHO |
| Immunization rates | World Development Indicator, World Bank |
| Governance | World Governance Indicators, World Bank |
| Democracy | Polity IV |
| Decentralization | Database of Political Institutions, World Bank |
| Log of Population | UNDP |
| GDP per capita (in constant 2000 US dollars) | World Bank Development Indicator |
| GDP per capita growth (annual %) | World Bank Development Indicator |
| Civil War | PRIO Dataset on Armed Conflict |

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