The Unhealthiness of Having Enemies:
How External Threat Reduces the Effectiveness of Foreign Health Aid

Tracy Kuo Lin

April 23, 2013

Abstract

Existing studies on foreign health aid provide incongruent results on the effectiveness of health aid. For example, while Mishra and Newhouse find that health aid improves domestic health outcomes (2009), Dietrich finds that health aid only improves health outcomes in states with a high level of corruption (2011). I suggest that an important casual mechanism explains the puzzling results from previous studies: magnitude of substitution effect. Substitution effect occurs when governments allocate less governmental funding for social policies with the incoming of foreign health aid. Combining the political science literature on social policies and the public health literature on substitution effect, I hypothesize that the efficacy of health aid is constrained by the magnitude of the substitution effect, which is conditioned on the external environment of aid-receiving countries. Using instrumental variables with a generalized method of moments estimator and mediation analysis (Imai et al 2012), I examine how the level of external threat is associated with the magnitude of substitution effect, which then influences public health outcomes. Preliminary results suggest that external threat can lead to an increased magnitude of substitution effect and reduce the effectiveness of health aid.

1. Introduction

International actors, from the United States President's Emergency Plan For AIDS Relief (PEPFAR) to the European Union, send a great amount of foreign health aid to improve health conditions in aid-receiving countries[1]. Health aid grew from approximately 5.5 billion dollars in 1990 to 21.8 billion dollars in 2007 (Ravishankar et al. 2009). However, despite the resources invested in public health, the effect of health aid remains a question. Given the relationship between health and national security[2] and concerning political responses to health issues[3], I pose the questions: How does foreign health aid influence the level of public health? What are the factors that influence the effectiveness of foreign health aid?

I highlight an important casual mechanism explaining the effectiveness of foreign health aid: magnitude of substitution effect. Substitution effect occurs when governments allocate less governmental funding for social policies due to incoming foreign health aid. I suggest that in addition to domestic factors, one of the main determinants of the magnitude of substitution effect is the external environment of states. My reasoning follows the guns versus butter dilemma, which hypothesizes the tradeoff between military and social spending (Duval 2003; Mintz and Huang 1991). I suggest states are more likely to divert original health budget with the income of aid when facing a high level of external threat. When states face an increase in external threat, states will have to allocate a higher budget for military expenditures and a lower budget for social spending, such as health care. And while external threat exacerbates the spending dilemma, alliance formation may mitigate the issue. With the increased demand to provide

[1] While there is a large literature on foreign aid in general (e.g. Easterly 2003; Sachs et al. 2004; Wright and Winters 2010) this study focuses specifically on health aid.
[2] See Garrett (2005); Letendre, Fincher, and Thornhill (2010); Price-Smith (2009)
[3] See Dionne (2010) and Lieberman (2007)

social goods, such as public health provisions, states can outsource their security burden to external allies (Kimball 2010).

Combining the political science literature on budgetary trade-offs and foreign aid and the public health literature on substitution effect, I hypothesize that the efficacy of health aid is constrained by the magnitude of the substitution effect, which is influenced by the external environment of aid-receiving countries. Using instrumental variables with a generalized method of moments estimator (GMM) and mediation analysis, I examine how the level of external threat is associated with the magnitude of substitution effect, which then influences public health outcomes. Preliminary results suggest that external threat can lead to an increased magnitude of substitution effect and reduce the effectiveness of health aid.

2. Health Aid Effectiveness

While numerous studies have explored the effects of foreign aid on economic development[4] (Easterly 2003; Sachs et al. 2004), scholars have only recently begun to disaggregate aid data by sector and examine the effects of specific foreign aid on designated outcomes. Given that there is evidence suggesting states behave differently toward different types of foreign aid, it is important to focus on sector-specific aid. Indeed, Carpenter argues that the politics of health differ from other policy arenas and suggests that one should approach cross-area generalization cautiously (2012). For example, Dietrich suggests that while corrupted governments divert economic aid, these same governments use health aid appropriately to signal good behavior (2011). The author argues that using health aid to signal good behavior will ensure future in flow of both economic aid and health aid.

[4] See Wright and Winters (2010) for a comprehensive review of foreign aid effectiveness on economic development.

Focusing on health aid, Mishra and Newhouse examine the effects of health aid on health levels and find that, on average, an increase of US $1.60 will lead to roughly 1.5 fewer infant deaths per year (2009). Exploring the conditions under which health aid is effective, Gebhard et al. use infant mortality rate and life expectancy as indicators for public health levels and control for factors such as level of democracy and corruption (2008). They find that despite the fact that the amount of health aid correlates with better health levels under certain conditions, such as higher GDP, the relationship is generally insignificant when compared to aggregate aid or non-health aid. The authors' preliminary results, despite being inconclusive, suggest that health aid does not improve the public health level of average health aid recipient countries.

Dietrich examines the effects of health aid on public health levels using the percentage of one-year-olds out of the total population who are immunized with the third dose of diphtheria-tetanus-pertussis vaccine (DTP3) as an indicator of health level (2011). Dietrich finds that governments with higher levels of corruption utilize improvements in public health levels to signal donor countries of good behavior. In other words, while governments with high levels of corruption may use foreign aid for other sectors improperly, these countries distribute health aid properly to ensure inflow of future foreign aid. As a result, the author concludes that health aid is more likely to ameliorate poor health levels in countries with a higher level of corruption.

The studies by Gebhard et al. (2008), Mishra and Newhouse (2009), and Dietrich (2011) draw attention to health aid, however these studies provide puzzling results, which are contradictory and draw more questions than answers. Therefore, there is still a great need to examine the impact of particular types of foreign aid on different outcomes. Specifically, more research is necessary to fully comprehend the impact of health aid on health levels in aid-recipient countries.

Through this paper, I hope to contribute to the understanding of health aid and health outcome in two ways. First, I broaden and standardize public health indicators. Different types of aid should target and ameliorate different areas of public health. For example, health aid given to cope with HIV/AIDS in recipient countries may not improve DTP3 vaccination rates because the aid is not directed toward the vaccination. In fact, some studies suggest that the focus on alleviating HIV/AIDS is displacing aid in other health issue areas (Shiffman 2008). Furthermore, changes in different areas of public health do not imply changes in public health overall. Health aid may be able to improve certain areas of public health more than other areas. The contradictory and counterintuitive results of the previous studies could be simply due to the different indicators of public health levels. In order to explore how health aid impacts different aspects of public health, I include indicators for public health that are employed in previous studies as well as additional indicators, such as more vaccination rates and infectious disease rates.

Second, I posit that the relationship between health aid and public health level is more complicated then previously argued and modeled. While previous authors take into account the level of democracy and the level of corruption, there are more intricate processes at work. I draw from the guns versus butter literature and suggest that one important causal mechanism – the magnitude of substitution effect – has a positive association with the external environment of aid-receiving states.

3. Theoretical Framework

By considering the guns versus butter dilemma, I focus on how international factors, in addition to domestic factors, can influence aid allocation. I suggest that states make the decision

to substitute an original health budget with health aid and use the original budget for other purposes when facing a high level of external threat in the international arena. In this section, I highlight the relationship between external environment and aid usage, focusing on the mechanism of substitution effect.

The literature on general foreign aid highlights different factors that influence a government's decision in aid allocation. Most of the studies focus on domestic factors that influence aid allocation. For example, applying the Selectorate Theory (Bueno De Mesquita et al. 2003), Kono and Montinola find that autocracies are more likely to divert development aid than democracies (2012). Another factor, as summarized by Wright and Winters is corruption: more corrupted governments are more likely to pocket aid (2010). Additionally, Wright finds that aid-receiving states with high level of personalist institutions are more likely to experience corruption (2010). Thus, aid effectiveness is lower is states with high levels of personalism.

The above is far from a comprehensive review of the studies that examine domestic influences to aid effectiveness. However, this brief overview suggests that states heavily base the decision of aid allocation on how aid can help the survival of the state rather than how aid can effectively help its targeted purposes. I contend that in addition to domestic factors, such as regime types, institution type, and level of corruption, when making decisions regarding resource allocation, the external environment influences aid allocation. I define the external environment of a state as the combination of the external threat level of the state and the alliance support available to the state.

First, looking at the effect of external threat, I suggest that an increase in the level of external threat is associated with a reduction in governmental incentive to spend on health. The reasoning follows the guns versus butter dilemma, which hypothesizes the tradeoff between

military and social spending (Duval 2003; Russett 1969). When states perceive an increase in external threat level, that is, an increase in potential international conflicts, states may feel the need to increase defense spending. Some studies suggest that military spending does not have a direct effect on social spending (e.g., Russett 1982). However, in an evaluation of long-term trends in advanced democracies, Domke et al. find evidence for the guns versus butter tradeoff (1983). Moreover, Mintz and Huang find direct and indirect effects of defense spending on investment and economic growth (1990). In a following study using a three-equation model Mintz and Huang find that an increase in military spending can indirectly lead to a reduction in social spending (1991).

Antonakis further provides support for Mintz and Huang's conclusion using Greece as a case study (1999). Examining the growth-defense relationship in Greece from 1960 to 1993, Antonakis finds that the annual output growth rate in Greece is negatively correlated to the size of the defense sector. The author suggests that the post-1974 threat of war and the oil-price shock in the 1970s hindered economic growth in Greece.

The guns versus butter dilemma literature focuses the effects of defense spending on welfare, but does not examine the direct effect of states' involvement in conflicts on welfare. Evaluating the effect of conflicts on domestic public health level, Iqbal suggests that conflicts damage domestic public health because of the reduction in health spending during times of conflict (2010). The author reasons that the reduction in health spending is due to lower economic growth and increased governmental spending during conflicts. As a result, fewer resources are available for health spending. The author finds that conflict is associated with increased military spending and a reduction in health spending in states.

Second, looking at alliance support, I suggest that an increased level of alliance support

provide governments the resources to increase the domestic health budget. While external threat exacerbates the spending dilemma, alliance formation may mitigate the issue. With the increased demand to provide social goods, such as public health provisions, states can outsource their security burden to external allies. As Kimball demonstrates, the likelihood of alliance formation increases with the increase in demand for social policies (2010). In essence, states contract out national security costs through the formation of alliances in order to be able to increase spending on social issues and cope with domestic concerns. As a result, an increase in alliances should mitigate the guns versus butter dilemma.

Simply looking at domestic budget allocation one observes that an increase in external threat can reduce incentives to spend on social policies, while an increase in alliances increases incentives to spend on social policies. However, the guns versus butter dilemma is slightly more complex when one includes foreign aid in the equation. Foreign health aid is often earmarked for water sanitation aid, food aid, malaria prevention aid, etc. Therefore, governments cannot always redirect health aid and use it for military or other purposes. Nevertheless, governments may use aid to substitute government spending; instead of keeping the original social spending budget, with the incoming aid governments can allocate less governmental funding for social policies. Thus, health aid can allow governments to spend fewer resources on health and more resources on the military and other purposes.

There is currently no consensus on the average level of substitution effect in health aid-receiving countries. Farag et al. find that a reduction in government spending is associated with an increase in donor funding; the proportionate decrease is the largest in low-income countries (2009). A subsequent analysis by Lu et al. concurs with Farag et al. and suggests an even stronger substitution effect exists for health aid than the effect Farag et al. find in their study

(2010). However, Bantiji and Bendavid reassess Lu et al.'s finding using a country fixed effects model and find that the substitution effect only occurs in countries that receive a low level of health aid (2012). In addition to the incongruent results, the authors do not explore any causal mechanisms or political factors that may impact the likelihood of this substitution effect.

I reason that the external environment of aid-receiving countries impacts health outcomes by affecting the magnitude of the substitution effect of health aid. An increase in external threat leads to a higher magnitude of the substitution effect. Similarly, a reduction in alliances leads to a higher magnitude of the substitution effect. In other words, in states facing high level of external threat, health aid frees up governmental resources on health, thus governments have additional resources to spend on the military.

An increase in the magnitude of the substitution effect at best leads to no changes in public health levels despite the presence of health aid because the needed international assistance in health becomes indirectly transferred to military assistance. In the worst cases, substitution effect can damage health outcomes in two ways. First, by providing resources for governments to spend on interests such as the military, it allows governments to consolidate. A consolidated government that has sufficient military backing may have less incentive to provide public goods such as public health. Second, substitution effect leads health systems to be reliant on unstable and inconsistent foreign resources. Therefore, foreign health in the presence of substitution effect not only does not improve health outcomes, but also can weaken health systems.

4. Hypotheses

Given this theoretical framework, I present the following hypotheses:

Hypothesis 1: States that face a higher level of external threat will yield a lower public health level.

Hypothesis 2: An increase in the level of external threat increases the magnitude of a substitution effect.

5. Data and Methods

This study includes data from 1985 to 2001 and encompasses 172 countries. The unit of analysis is country–year. I use a generalized method of moments (GMM) estimator with an instrumental variable and include an interaction term to examine Hypothesis 1 and Hypothesis 2. Then, I employ mediation analysis to further explore the dynamic relationship between external threat, substitution effects, and health outcomes.

5.1 GMM

In order to empirically examine if the effectiveness of health aid differs according to the level of external threat, I follow Dietrich and employ a GMM estimator (2011). The two-step GMM weights the moment of conditions by a consistent estimate of their covariate. In the first step, the estimator generates estimates of parameters and residuals. Then the second step uses the initial estimates of the parameters to construct a weight matrix that is based on the covariance of the moments. The advantage of GMM over the standard two-stage least squares instrumental variable (IV) estimator is that in cases where heteroskedasticity is present, the GMM estimator is more efficient than the simple IV estimator. Furthermore, in cases where heteroskedasticity is not present, the GMM estimator is no worse asymptotically than the IV estimator (Baum, Schaffer, and Stillman 2003).

5.3 Mediation Analysis

As a robustness test to further examine if health aid allows for the reallocation of original

health budgets for military purposes, I conduct a causal mediation analysis (Imai et al. 2011; Imai, Keele, and Yamamoto 2010) employing health spending is an intermediate variable connecting foreign health aid and military spending. Causal mediation analysis allows me to determine the process whereby foreign aid affects military spending through an intermediate variable or a mediator. The traditional approach to determining causal mediation effect employs structural equation models. However, Imai et al. argue that structural equation models rely upon untestable assumptions. The causal mediation analysis method and software (Hicks and Tingley 2011) incorporates sensitive analysis to formally quantify the degree to which empirical findings reply on the key assumptions. In addition, causal mediation analysis is an especially suitable alternative to the traditional structural equation modeling (Maruyama 1998) for this study because it allows me to incorporate dichotomous dependent variables (Hicks and Tingley 2011; Imai et al. 2011). In this study, the intermediate variable is health spending.

5.3 Instrumental Variables

Following previous works (Savun and Tirone 2011; Wright 2008), I cope with the selection bias by using natural disasters in a given year and previous colonial ties as instrumental variables. These studies demonstrate that countries with previous colonial ties and countries that recently experienced natural disasters are more likely to receive more foreign aid. Because health aid is interacted with external threat, I interact external threat with my instrumental variables in the first stage. The instrumental variables pass the three standard validity tests: Hausman test of endogeneity, F-statistics of greater than 10, and Hansen's J test.

5.4 Dependent Variable

The dependent variable in this study is public health level. However, there are numerous indicators of public health level. Gebhard et al. employ infant mortality rate and life-expectancy (2008). Dietrich employs third dose of diphtheria-tetanus-pertussis vaccine (DTP3) rates (2011). Other scholars, such as Price-Smith (2009), use infant mortality while trying to capture the burden of diseases. However, as Price-Smith acknowledges, many public health issues such as HIV/AIDS affect the central part of the age demographics distribution. Infant mortality therefore does not capture the full picture of public health.

Ideally, one should employ a comprehensive indicator of public health to evaluate the impact of health aid on health levels. Two of such indicators are the DALE and DALY indicators constructed by the World Health Organization (Lopez et al. 2006; Murray and Lopez 1997). However, the indicators are currently restricted to only two years. Therefore, in order to examine the effects of health aid as comprehensively as possible, I employ the indicators that previous authors have employed plus an additional indicator of vaccination and indicators of disease burden. They are not perfect measures individually; but when examined in conjuncture, they present a more lucid picture of the influence of health aid on public health levels in countries.

The indicators for public health level and public health conditions included in this study are: (1) DTP3, (2) infant mortality rate (IMR), (3) HIV/AIDS prevalence rate, and (4) health spending. The indicator for DTP3 and HIV/AIDS prevalence rate are from the World Health Organization (WHO) dataset. The DTP3 variable indicates the percentage of one-year-olds out of the total population who are immunized with the third dose of DTP3. HIV/AIDS prevalence rate indicate the percentage of the population infected with HIV/AIDS.

The IMR is the number of deaths of infants (less than 1 year of age), excluding stillbirth.

I use the IMR dataset constructed by Abouharb and Kimball (2007). The reason for employing Abouhard and Kimball's dataset instead of the WHO dataset is due to the fact that the WHO dataset on IMR is restricted to only a few years. On the other hand, using 50 sources worldwide Abouhard and Kimball's dataset provides IMR from 1816 to 2002.

The dataset for health spending is from the WHO's National Health Accounts (NHA). The dataset provides information on the percentage of government spending on health each country-year. Because the NHA dataset only includes observations after 1996 and the SRG dataset ends in 2001, my models that include health spending only contain five years of observations. All of the independent variables are lagged for one year to establish temporal precedence.

5.5 Independent Variables

The main independent variable of this study is amount of health aid. In contrast with previous literature, I use health aid per capita per county-year instead of total health aid per country-year. I reason that the size of the population is an important factor because the effectiveness of health aid depends on how much resources an individual in aid-receiving countries can acquire. The data are from Aid Data (2011).

To examine the effect of external environment on foreign health aid effectiveness, I employ Maoz's measure of Strategic Reference Group (SRG) to capture external threats (2009). SRG essentially consists of states that may have the opportunity and will to threaten or attack the focal state. This indicator not only includes direct rivalry but also considers strategic rivals that may not have had prior conflicts with each other as threats (Maoz 2011). In order to explore the conditional effect of external threat on aid effectiveness, I interact external threat with the

amount of health aid per capita. I use the Alliance Treaty Obligations and Provisions data (Leeds et al. 2002) to capture the alliance support of nations.

5.6 Control Variables

I include several variables to control for potential validity threats: (1) GDP per capita, (2) intensity of civil and international conflict (if present), (3) age distribution, (4) number of doctors per 1000 people, (5) level of corruption, (6) Africa indicator, (7) polity, and (8) state capacity. Similar to the independent variables, these control variables are lagged by one year to establish temporal precedence and show that the hypothesized cause occurs before the observed effect.

Controlling for GDP per capita (World Bank 2009 dataset) ensures that there are not varying rates of regression to the mean of the different nations simply because of varying social situations. Nations with poor state infrastructure are more inadequate and less effective at coping with health issues. Therefore, these less effective infrastructures are more sensitive to shocks such as disease outbreaks. More developed nations, with more stable infrastructures and effective public health infrastructures, are more immune to disease outbreaks (Lieberman 2007). Lieberman also suggests that GDP per capita and economic growth influence a state's ability and willingness to spend resources on health prevention.

Previous conflicts can lead to a worsening state of health in countries (Elbe 2002; Iqbal 2006; Iqbal and Zorn 2010). To take into account the impact of disease prevalence stemming from previous conflicts, my models control for instances of conflicts in the previous year. I include magnitudes of both interstate and intrastate conflicts in the previous country- year in my models. The dataset is from the Major Episode of Political Violence project.

As previously mentioned, corruption may effect how foreign aid is used (Dietrich 2011; Gebhard et al. 2008). States can divert the aid away from its main purpose. Or, states can use health aid properly as a way to strategically solicit more aid from donor countries. Therefore, I include an indicator of corruption, which is from the International Country Risk Group (ICRG) dataset.

To control for the state of the health system and infrastructure in each country I include the number of doctors per 1000 people. While this indicator only captures part of the health care system, this is one of the most comprehensive worldwide indicators on country-level health care. However, there are still missing observations for this indictor. I employ multiple imputations to cope with the fact that the observations are not missing at random (King et al. 2001).

One also needs to account for the state of health in the country. To do so, I follow Mishra and Newhouse and lag the health indicator used as the dependent variable one year to account for the state of health in the country (2009). This control variable thus varies with the dependent variable in each model.

Age is a strong risk factor for many health outcomes (Szklo and Nieto 2007). The age distribution in a country affects the disease distribution, mortality rate, and productively of the population. Therefore, I control for the varying age structure in countries using the percentage of dependents to capture the difference in age structure.

Africa is known to have relatively worse health conditions compared to the rest of the world. Thus, I include a dichotomous indicator for Africa to control for the extreme disparity in health between African countries and other countries. Lastly, I include a dichotomous indicator for the Cold War to capture the difference in international behavior and aid between the pre-Cold War era and the post-Cold War era.

Bureaucratic quality encompasses important components of the theoretical construct of government abilities, such as professionalism, insulation from political pressure, and most importantly, efficacy in delivering government services. The indicator ranges from zero to four bureaucratic quality points. Higher bureaucratic quality points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. Hendrix demonstrates through statistical analysis that this indicator has high construct validity, that is, the inferences can legitimately be made from the operationalization to the theoretical construct (2010). This indicator allows me to examine whether or not there is adequate efficacy in a government to appropriately disperse health aid. The data for bureaucratic quality are derived from the ICRG.

I also examine the influence regime type has on the effectiveness of health aid. Leaders of different regimes derive distinct benefits from using aid appropriately. For example, Kono and Montinola (2009) suggest that aid may have different effects on the survival of leaders in different regimes. Therefore, leaders have incentives to use aid differently. Kono and Montinola also show that regime type can influence how leaders misuse development aid for military purposes (2012). Furthermore, regime type captures the extent to which leaders and politicians are incentivized to react to public opinion. For example, in democracies, leaders and politicians may have higher incentives to use aid properly to ensure reelection. The data for polity scores are from the Polity II-IV dataset.

6. Results and Analysis

[Insert TABLE 1 about here]

First, I examine the relationship between external threat, health aid, and domestic health outcomes using a GMM model. Table 1 provides the results for the relationship between external threat, health aid, and DTP3. I first present a model without two of the control variables, level of corruption and bureaucratic quality, because missing observations in these variables significantly reduce the sample size. Model 1 in Table 1 indicates the interaction between foreign health aid and external threat has a statistically significant positive relationship with DTP3 vaccination rate. To aid interpretation, the interaction of foreign health aid and external threat is plotted in Figure 1. The figure shows that a higher level of health aid is associated with a higher level of DTP3 vaccination rate. However, as the level of external threat increases, the level of DTP3 vaccination rate decreases. The findings support my hypothesis that a high level of external threat reduces health aid effectiveness.

[Insert FIGURE 1 about here]

Model 2 and Model 3 in Table 1 include the level of corruption and bureaucratic quality as control variables. Including these variables drops states whose level of corruption and bureaucratic quality are not measured from the sample. Unfortunately, the missing observations are not missing at random; most of the states that are dropped from the sample are low-income states with low levels of threat. The remaining states that are included in Model 2 and Model 3 are thus states with high income, high bureaucratic quality, and higher threat levels. As a result, one can see that corruption and bureaucratic quality are significant in Model 2 and Model 3 while the interaction term between external threat and aid is not significant. Given that bureaucratic quality, as well as corruption, is highly correlated with GDP per capita (correlation is 0.69), I contend that GDP per capita actually captures state capacity. Thus, Model 1 best highlights the relationship between external threat, health aid, and DTP3 vaccination rate.

Table 2 provides the results for the relationship between external threat, health aid, and HIV/AIDS prevalence rate and IMR. While the interaction term between heath aid and external threat is significant in both the HIV/AIDS and the IMR models, these models provide a puzzling result: the constituent term on external threat is associated with better health outcomes. This result may be due to the fact that many states with lower GDP per capita and poorer health outcomes are also the states that are less connected in the international system. With fewer interactions in the international system these states tend to have lower level of external threat. Alternatively, states that have internal issues may be less likely to engage in conflictual behavior internationally.

[Insert TABLE 3 about here]

Second, I employ a GMM model with interaction terms to examine the relationship between foreign health aid, external threat, and domestic health budget. The results for the model are presented in Table 3. Foreign health aid and the level of external threat each have a statistically significant negative relationship with domestic health budget. An increase in foreign health aid is associated with a reduction in domestic health budget. And an increase in the level of external threat is associated with a reduction in domestic health budget. The interaction between foreign health aid and external threat has a statistically significant positive relationship with domestic health budget. To facilitate interpretation, the interaction of foreign health aid and external threat is plotted in Figure 2. The figure shows that when holding external threat constant, an increase in foreign health aid is associated with reduction in domestic health budget. This relationship is significant for external threat levels below 0.6. Once the external threat level is higher than 0.6, the relationship is no longer significant. This finding suggests that states facing an extremely high level of external threat already have a high military budget. Therefore,

even with the income of foreign health aid, states do not see the need to reallocate health budgets for military purposes.

[Insert FIGURE 2 about here]

Table 3 also shows that alliances have a statistically significant positive relationship with domestic health spending. That is, states with higher levels of alliance support are more likely to allocate more resources to health. This result is in line with Kimball's (2010) findings, which suggest that by forming alliances, states outsource military support to their allies and spend the additional resources on social goods.

After controlling for external threat and alliances, however, the presence of conflict no longer has a statistically significant impact on domestic health budget. This finding may be due to the fact that states' calculation for budget allocation using external threat and alliances captures the likelihood of conflicts. As a result, the effect of the level of external threat washes out the effect of conflict in influencing domestic health budgets.

[Insert TABLE 4 about here]

Third, I examine if the reduction of domestic health budget in the presence of health aid is due to the pressure of high external threat. Under the external threat logic, governments reduce the health budget so they can utilize the resources for military expansion under increasing external threat. To empirically test this logic, I employ causal mediation analysis to test if the reduction of domestic health budget is associated with increased military expenditures. Table 4 provides the results for the causal mediation model. I first examine if governments unconditionally reduce health budget in the presence of health aid. Model 9 in Table 4 shows that increased amounts of health aid are associated with a reduction in health spending. However, health aid does not directly increase military spending. The results from Model 9 indicate that

governments do not simply reduce governmental spending on health and engage in substitution effect whenever they receive aid; the existence of substitution effect is conditional.

Model 10 in Table 4 examines if the external threat drives the magnitude of substitution effect, reducing general spending in order to increase military spending. The results from Model 10 indicate that increased levels of external threat and increased levels of health aid reduce health spending. A reduction in health spending is associated with an increase in military spending. Furthermore, an increased level of external threat is associated directly with an increase in military spending. In addition to utilizing health aid to fund military expenditures, governments draw resources from other areas as well.

The results suggest that that a one standard deviation increase in external threat level is associated with 1.7% reduction in health coverage. In a median country with median population, this result means that with a one standard deviation increase in the level of external threat approximately 124,000 people will lose governmental health coverage. This figure represents the number of individuals that will lose health coverage after taking into consideration health aid.

7. Conclusion

In this paper I suggest that the effectiveness of foreign health aid is constrained by the external environment of states. The preliminary results suggest foreign health aid leads to a substitution effect in aid-receiving states. And, a substitution effect is more severe when aid-receiving states face high levels of external threat. High levels of external threat are associated with lower health spending and lower preventive care, such as vaccination rate.

This study also finds that while an increased level of external threat is associated with a reduction in health spending and preventive care, an increased level of external threat is not

associated with overall poorer health outcomes. I reason that states may be balancing internal and external threats. When states face a high level of threat they may be less likely to engage in conflictual behavior externally. As a result, we may observe states with a high level of internal instability and poor health outcomes have less external threat. These results provide motivation for future research; however, to explore these results in detail is beyond the scope of this paper.

This study demonstrates that external environment is important in conditioning the effectiveness of foreign health aid; when facing external threat states are likely to employ substitution effects to provide more resources for military expansion. Therefore, when awarding aid, it is important to include conditionality to prevent aid-receiving countries from substituting governmental health spending with health aid.

Figure 1

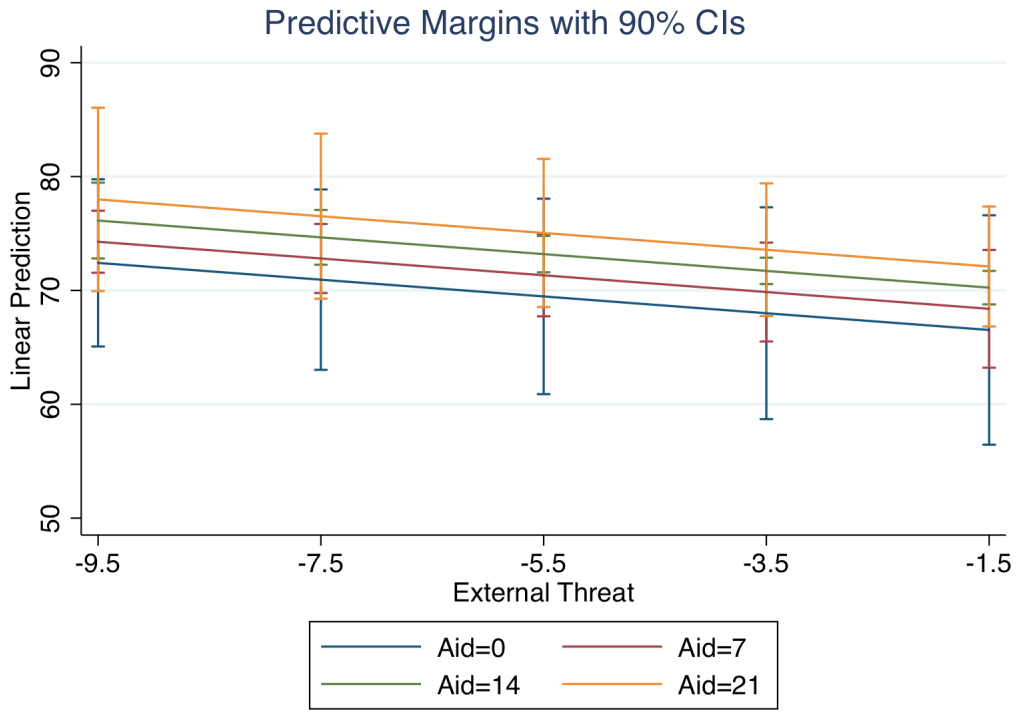
Predictive Margins with 90% CIs
Linear Prediction
90
80
70
60
50
-9.5
-7.5
-5.5
-3.5
-1.5
External Threat
Aid=0
Aid=7
Aid=14
Aid=21

Figure 2

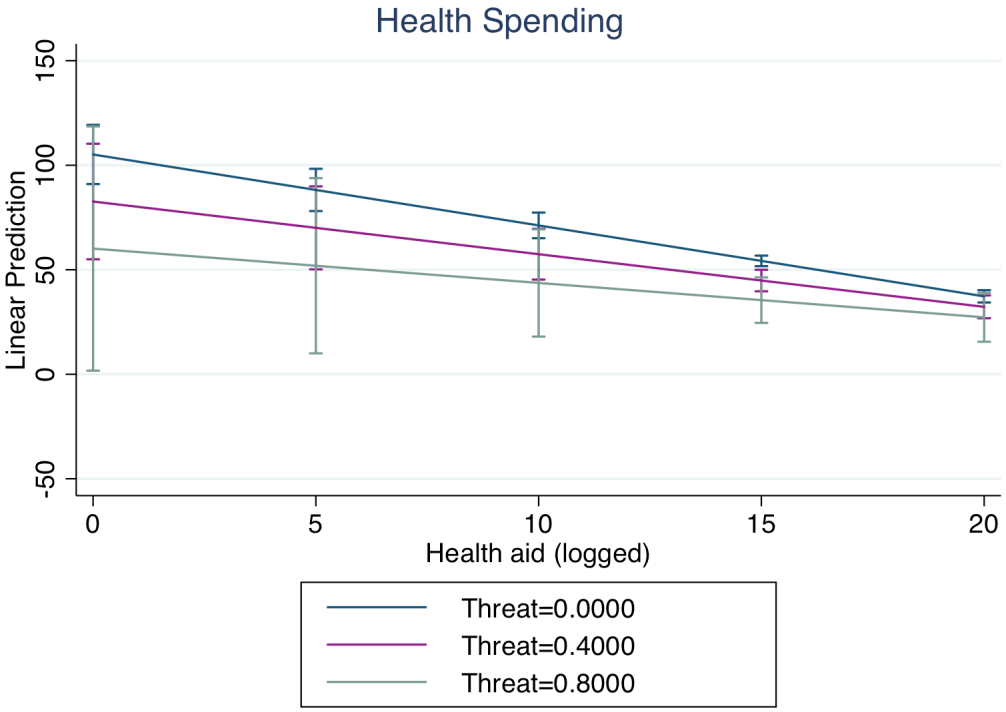
Health Spending
Linear Prediction
150
100
50
0
-50
0
5
10
15
20
Health aid (logged)
Threat=0.0000
Threat=0.4000
Threat=0.8000

Table 1: GMM Model Result for DTP3

	DTP3		
	Model 1	Model 2	Model 3
Aid* Threat	.05*	.02	-.01
	(.03)	(.03)	(.03)
Aid	.27	.42	104.34
	(.44)	(.47)	(6.97)
Threat	-.74**	-.58*	-.28
	(.31)	(.32)	(.29)
Alliance	.46***	.36***	.33***
	(.06)	(.05)	(.05)
Regime	-1.46	-5.29***	-6.41***
	(.91)	(.84)	(.86)
GDP	-.00	-.00	-.00
	(.00)	(.00)	(.00)
Conflict	-2.49***	-2.46***	-2.30***
	(.30)	(.28)	(.27)
Age	-.65***	-.50***	-.50***
	(.04)	(.04)	(.04)
Africa	-8.93***	-15.04***	-15.62
	(1.51)	(1.49)	(1.45)
BQ		2.88***	1.45***
		(.60)	(.55)
Corruption			2.51***
			(.56)
Constant	117.74***	104.34***	101.64***
	(5.49)	(6.98)	(7.31)
N	2256	1720	1720
R2	.43	.51	.52

Table 2: GMM Model Result for HIV/AIDS and IMR

	Model 4: HIV/AIDS	Model 5: HIV/AIDS	Model 6: IMR	Model 7: IMR
Aid* Threat	.003	.01**	.19***	.04
	(.004)	(.004)	(.07)	(.06)
Aid	-.21*	-.12	-1.67**	-2.42***
	(.12)	(.09)	(.67)	(.80)
Threat	-.14***	-.18***	-1.19*	-.22
	(.05)	(.05)	(.73)	(.65)
Alliance	-.03**	-.03**	.39***	.13
	(.01)	(.01)	(.13)	(.13)
Regime	.38*	.42**	-11.10***	-1.81
	(.19)	(.17)	(1.40)	(1.60)
GDP	-.00*	.00	-.00***	-.00***
	(.00)	(.00)	(.00)	(.00)
Conflict	-.08		4.39***	4.34***
	(.06)		(.48)	(.57)
Age	.03**	.02*	1.12***	.93***
	(.01)	(.01)	(.07)	(.07)
Africa	2.57***	2.89***	39.30***	43.71***
	(.36)	(.29)	(2.35)	(2.63)
Corruption		-.27***		-3.99***
		(.10)		(1.03)
BQ		.08		-4.38***
		(.08)		(.93)
Constant	-6.53***	-6.23***	-7.11	33.41***
	(1.32)	(1.37)	(7.33)	(12.59)
N	1279	1063	2400	1760
R2	.10	.25	.62	.62

Table 3: GMM Model for Health Spending

	Model 8: Health Spending
Health Aid (per capita)	-9.75*
	(5.14)
Threat*Aid	19.57**
	(8.95)
External Threat	-355.95**
	(156.13)
Alliances	1.00***
	(.11)
Polity	.24***
	(.09)
GDP (per capita)	-.00
	(.00)
Conflicts	.92
	(1.64)
Constant	207.42**
	(87.28)
N	698
R2	.01

Table 4: Mediation Analysis

Main Treatment		Model 9: Aid	Model 10: Threat
Predicting Health Spending (Mediator)		Health Spending	Health Spending
	Aid	-.36***	-.35***
		(.09)	(.09)
	Threat	-.36**	-.51**
		(.13)	(.24)
	Alliance	.93***	.90***
		(.12)	(.12)
	Regime	.13	.27
		(1.60)	(1.56)
	Conflict	-.35	-.48
		(.45)	(.45)
	GDP	.00***	.00
		(.00)	(.00)
	Constant	23.59***	22.46***
		(3.63)	(3.57)
Predicting Military Spending		Military Spending	Military Spending
	Health Spending	.03***	.04***
		(.004)	(.004)
	Aid	-.01	-.01
		(.01)	(.01)
	Threat	.19***	.20***
		(.03)	(.03)
	Alliance	-.04***	-.04***
		(.01)	(.01)
	Regime	-1.67***	-1.67***
		(.18)	(.18)
	Conflict	.03	.03
		(.05)	(.05)
	GDP	.00	.00
		(.00)	(.00)
	Constant	4.01***	4.01***
		(.42)	(.42)
ACME (Effect of Health spending)		-.01***	-.02***
		(-.02, -.005)	(-.04, -.001)
Direct Effect		-.01	.19***
		(-.03, .007)	(.14, .24)
	N	662	662
	R2	.24	.23

References

Abouharb, M. R., and A. L. Kimball. 2007. A New Dataset on Infant Mortality Rates, 1816 2002. *Journal of Peace Research* 44 (6): 743-754.

Antonakis, Nicholas. 1999. Guns versus Butter: A multisectoral Approach to Military Expenditure and Growth with Evidence from Greece, 1960-1993. *The Journal of Conflict Resolution* 43 (4): 501-520.

Batniji, Rajaie, and Eran Bendavid. 2012. Does Development Assistance for Health Policy Really Displace Government Health Spending? Reassessing the Evidence. *PLOS Medicine* 9 (5): 1-7.

Baum, Christopher F., Mark E. Schaffer, and Steven Stillman. 2003. Instrumental variables and GMM: Estimation and testing *Stata Corporation*.

Belsley, David A. 1988. Two- or Three-Stage Least Squares? *Computer Science in Economics and Management* 1: 21-30.

Bueno De Mesquita, Bruce, Alastair Smith, Randolph M. Siverson, and James D. Morrow. 2003. *The Logic of Political Survival*. Cambridge, Massachusetts: The MIT Press.

Carpenter, Daniel. 2012. Is Health Politics Different? *Annual Review of Political Science* 15 (1): 287-311.

Dietrich, Simone. 2011. The Politics of Public Health Aid: Why Corrupt Governments Have Incentives to Implement Aid Effectively. *World Development* 39 (1): 55-63.

Dionne, Kim Yi. 2010. The Role of Executive Time Horizons in State Response to AIDS in Africa. *Comparative Political Studies* 44 (1): 55-77.

Domke, William K., Richard C. Eichenberg, and Catherine M Kelleher. 1983. The Illusion of Choice: Defense and Welfare in Advanced Industrial Democracies, 1948-1978. *The American Political Science Review* 77 (1): 19-35.

Duval, Robert. 2003. Trading Bases: Resolving the Guns vs Butter Tradeoff Puzzle via Full Specification. *Draft*.

Easterly, William. 2003. Can Foreign Aid Buy Growth? *The Journal of Economic Perspectives* 17 (3): 23-48.

Elbe, Stefan. 2002. HIV/AIDS and the Changing Landscape of War in Africa. *International Security* 27 (2): 159-177.

Farag, Marwa, A. K. Nandakumar, Stanley S. Wallack, Gary Gaumer, and Dominic Hodgkin. 2009. Does funding from donors displace government spending for health in developing countries? *Health Affairs* 28 (4): 1045-55.

Gebhard, Nathaniel, Katherine Kitterman, Ashley Anne Mitchell, Daniel L. Nielson, and Sven Wilson. 2008. Healthy Aid? Prelimiary results on Health Aid Effectiveness. *Draft*.

Hendrix, C. S. 2010. Measuring state capacity: Theoretical and empirical implications for the study of civil conflict. *Journal of Peace Research* 47 (3): 273-285.

Hicks, Raymond, and Dustin Tingley. 2011. Causal Mediation Analysis. *Stata Journal* 11 (4): 609-615.

Imai, Kosuke, Luke Keele, Dustin Tingley, and Teppei Yamamoto. 2011. Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies. *American Political Science Review* 105 (04): 765-789.

Imai, Kosuke, Luke Keele, and Teppei Yamamoto. 2010. Identification, Inference and Sensitivity Analysis for Causal Mediation Effects. *Statistical Science* 25 (1): 51-71.

Iqbal, Zaryab. 2006. Health and Human Security: The Public Health Impact of Violent Conflict. *International Studies Quarterly* 50: 631-649.
———. 2010. *War and the Health of Nations*. Palo Alto, California: Stanford University Press.
Iqbal, Zaryab, and Christopher Zorn. 2010. Violent Conflict and the Spread of HIV/AIDS in Africa. *The Journal of Politics* 72 (01): 149.
Kimball, Anessa L. 2010. Political survival, policy distribution, and alliance formation. *Journal of Peace Research* 47 (4): 407-419.
King, Gary, James Honaker, Anne Joseph, and Kenneth Scheve. 2001. Analyzing Incomplete Political Science Data: An Alternative Algorithm for Multiple Imputation. *The American Political Science Review* 95 (1): 49-69.
Kono, Daniel Yuichi, and Gabriella R. Montinola. 2009. Does Foreign Aid Support Autocrats, Democrats, or Both? *The Journal of Politics* 71 (02): 704.
———. 2012. The Uses and Abuses of Foreign Aid: Development Aid and Military Spending. *Political Research Quarterly*.
Leeds, Brett Ashley, Jeffrey M. Ritter, Sara McLaughlin Mitchell, and Andrew G. Lang. 2002. Alliance Treaty Obligations and Provisions, 1815-1944. *International Interactions* 28: 237-260.
Lieberman, Evan S. 2007. Ethnic Politics, Risk, and Policy-Making: A Cross-National Statistical Analysis of Government Responses to HIV/AIDS. *Comparative Political Studies* 40 (12): 1407-1432.
Lopez, Alan D., Colin D. Mathers, Majid Ezzati, Dean T. Jamison, and Christopher J. L. Murray. 2006. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *The Lancet* 367 (9524): 1747-1757.
Lu, Chunling, Matthew Schneider, Paul Gubbins, Katherine Leach-Kemon, Dean T. Jamison, and Christopher J. L Murray. 2010. Public financing of health in developing countries: a cross-national systematic analysis. *The Lancet* 375: 1375-1387.
Maoz, Zeev. 2009. The Effects of Strategic and Economic Interdependence on International Conflict Across Levels of Analysis. *American Journal of Political Science* 53 (1): 223-240.
———. 2011. *Networks of Nations: The Evolution, Structure, and Impact of International Networks, 1816-2001*. New York, New York: Cambridge University Press.
Maruyama, Geoffrey M. 1998. *Basics of Structural Equation Modeling* Thousand Oaks: SAGE Publications.
Meernik, James, Eric L. Krueger, and Steven C. Poe. 1998. Testing Models of U.S. Foreign Policy: Foreign Aid during and after the Cold War. *The Journal of Politics* 60 (1): 63-85.
Mintz, Alex, and Chi Huang. 1990. Defense Expenditures, Economic Growth, and the "Peace Dividend". *The American Political Science Review* 84 (4): 1283-1293.
———. 1991. Guns versus Butter: The Indirect Link. *American Journal of Political Science* 35 (3): 738-757.
Mishra, Prachi, and David Newhouse. 2009. Does health aid matter? *Journal of health economics* 28 (4): 855-72.
Murray, Christopher J. L., and Alan D. Lopez. 1997. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *The Lancet* 349: 1436-1442.
Nielsen, Richard A., Michael G. Findley, Zachary S. Davis, Tara Candland, and Daniel L. Nielson. 2011. Foreign Aid Shocks as a Cause of Violent Armed Conflict. *American Journal of Political Science* 55 (2): 219-232.

Price-Smith, Andrew. 2002. *The Health of Nations: Infectious Diseas, Environmental Change and Their Effects on National Security*. Cambridge, Massachusetts: MIT Press.
———. 2009. *Contagion and Chaos: Disease, ecology, and national security in the era of globalization*. Cambridge, Massachusetts: MIT Press.
Ravishankar, Nirmala, Paul Gubbins, Rebecca J. Cooley, Katherine Leach-Kemon, Catherine M. Michaud, Dean T. Jamison, and Christopher J. L Murray. 2009. Financing of global health: tracking development assistance for health from 1990 to 2007. *Lancet* 373: 2113-24.
Russett, Bruce. 1969. Who Pays for Defense? *The American Political Science Review* 63 (2): 412-426.
Sachs, Jeffrey, John W. McArthur, Guido Schmidt-Traub, Margaret Kruk, Chandrika Bahadur, Michael Faye, and Gordon McCord. 2004. Ending Africa's Poverty Trap. *Brookings Papers on Economic Activity* 2004 (1): 117-240.
Savun, Burcu, and Daniel C. Tirone. 2011. Foreign Aid, Democratization, and Civil Conflict: How Does Democracy Aid Affect Civil Conflict? *American Journal of Political Science* 55 (2): 233-246.
Shiffman, Jeremy. 2008. Has donor prioritization of HIV/AIDS displaced aid for other health issues? *Health policy and planning* 23 (2): 95-100.
Szklo, Moyses, and F Javier Nieto. 2007. *Epidemiology: Beyond the Basics*. Second ed. Sudbury, MA: Jones and Bartlett Publishers.
Wright, Joseph. 2008. To Invest or Insure?: How Authoritarian Time Horizons Impact Foreign Aid Effectiveness. *Comparative Political Studies* 41 (7): 971-1000.
———. 2009. Foreign Aid and Democratic Consolidation. *Draft*.
———. 2010. Aid Effectiveness and the Politics of Personalism. *Comparative Political Studies* 43 (6): 735-762.
Wright, Joseph, and Matthew Winters. 2010. The Politics of Effective Foreign Aid. *Annual Review of Political Science* 13 (1): 61-80.