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Foreign Aid and Human Development: The Impact of Foreign Aid to the Health Sector

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The appropriate role of foreign aid in promoting economic development has long been debated. With the recent change of focus from economic to human development, it is timely to investigate the effectiveness of aid in promoting human development. This paper is the first to empirically test the hypothesis that increases in human welfare can be achieved through health sector specific foreign aid. My results indicate that foreign aid is ineffective at increasing overall health and is an unsuccessful human development tool. These results hold after controlling for reverse causality and are robust to different model specifications.

JEL Classification: F, I1

1. Introduction

> International aid is one of the most powerful weapons in the war against poverty. Today that weapon is underused and badly targeted. There is too little aid and too much of what is provided is weakly linked to human development. United Nations Development Programme 2005, p. 75

According to the 2005 Human Development Report (United Nations Development Programme 2005), there is a general consensus that foreign aid's first objective should be human development. In 2000, governments from various countries met at the United Nations and signed the Millennium Declaration, a pledge "to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty." One way of achieving these goals is through development assistance (United Nations Development Programme 2005). This advice has been widely accepted in the donor community during the past five years because total aid to the health sector has more than doubled. For example, as illustrated in Figure 1, from 1999 to 2004 aid to the health sector rose from $1930 to $4435 millions of 2004 dollars (OECD 2007).

With growing intensity given to international human development aid, an analysis of its effectiveness is worthwhile. Both conceptual and empirical literature debates the effectiveness of foreign aid for economic development without a general consensus on the role of foreign assistance in economic development. Two contrasting hypotheses have emerged. One is a public

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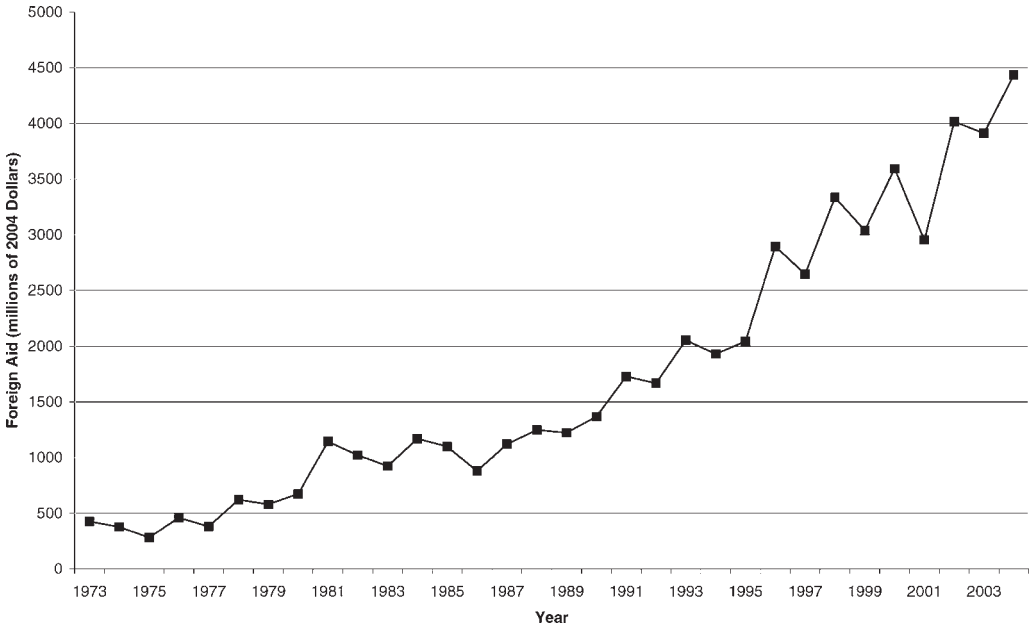

Figure 1. Foreign Aid to the Health Sector 1973–2004

interest argument where some authors state that aid can and should be used to assist in the development process (Sen 1999; Sachs 2005). The other is a public choice hypothesis that presents arguments indicating that foreign assistance is ineffective and has the potential to damage future growth opportunities (Bauer 2000; Easterly 2001).

These two competing hypotheses lead to different predictions on the use of foreign aid for human development. For a clear answer, one must turn to empirical analysis. Current empirical literature primarily supports the public choice perspective, indicating that foreign aid is ineffective in promoting economic development (Filmer and Pritchett 1999; Svensson 1999; Filmer, Hammer, and Pritchett 2000, 2002; Knack 2001; Brumm 2003; Brautigam and Knack 2004; Economides, Kalyvitis, and Philippopoulos 2004; Djankov, Montalvo, and Reynal-Querol 2005; Hartford and Klein 2005; and Heckelman and Knack 2005). In these studies, the authors focus on the impact of foreign aid on economic development and find no significant impact. However, in a recent study by Gomanee, Girma, and Morrissey (2005), the authors show that aid can improve human welfare through increases in certain public expenditures, supporting the public interest predictions. Their methodological approach neglects to control for endogeneity and this could lead to biased results. Thus, further analysis is required.

With the recent shift in the promotion of aid from economic to human development, it is timely to investigate the role of foreign aid for human development purposes. This paper provides the next step in the literature by establishing the link between foreign aid and human welfare. This is the first examination to utilize aid earmarked specifically to the health sector (health aid) to determine its effect on human development. Other studies have generally analyzed the impact overall foreign aid has had on human welfare, but none uses aid specifically to the health sector. To effectively perform this analysis, I build off the existing development literature and extend the same empirical methodology, including instrumental variable estimation to control for reverse causality. My results support the public choice

perspective, indicating that international aid to the health sector is ineffective in improving human welfare. My findings are robust to different model specifications and a variety of health indicators. This suggests that foreign aid may not be an effective way of improving health in developing countries.

The next section outlines the empirical model and data used in the analysis. A fixed effects model is the benchmark specification. The core analysis builds off of this basic specification by implementing an instrumental variable to control for possible reverse causality issues. A detailed discussion of the validity of the instruments is provided. Section 3 presents the results of the fixed effects model and the instrumental variable model. Section 4 presents three different robustness checks that confirm my results. Also, results are presented that strengthen the legitimacy of my instruments. Section 5 concludes.

2. Empirical Model and Data

The first model presented is a fixed effects regression that is used as the baseline specification. Next, instrumental variable estimation is implemented as the core analysis. Detailed description of the data is also provided in this section, including defining all variables, listing the data sources, and providing the descriptive statistics.

Benchmark Specification

The strategy employed is a fixed effects model that controls for country and year effects with robust standard errors[1]:

$$Y_{i,t} = \mu + \beta AID_{i,t} + Z'_{i,t}\delta + \varepsilon_{i,t},$$

where Y = health indicators, AID = health aid, and Z = control vector. The main variable of interest is foreign aid to the health sector. Health aid over the past five years accounts for roughly 7% of all official development assistance granted. The data for this variable was taken from OECD's Credit Reporting System that gives detailed breakdowns of official development assistance and official aid in developing and transitioning countries by sector (in 2004 dollars). I collected foreign aid to the health sector for all countries that received this type of aid. Detailed flow analysis is only available from 1973 onward, so this has limited my data set for the period 1973 to 2004.

Five main health indicators are used to capture the overall quality of health in a country. These include infant mortality, life expectancy, death rate, and immunizations (DPT and measles). These variables were collected from the 2006 World Development Indicators. The death rate is a crude measure that estimates the number of deaths occurring during the period. It is estimated per 1000 of the population at midyear. If aid is effective on human development, it should have a negative relationship with the death rate: As more aid flows to the health sector, the death rate should fall. Life expectancy at the time of birth, reported in years, is another variable we would expect effective health aid to affect, raising the expectancy of one's life. Immunizations (DPT and measles) are the percent of children 12–23 months that receive

[1] A Hausman test was run on each indicator to confirm the superiority of a fixed effects model over random effects.

the vaccine before reaching one year of age. Health aid should increase this percentage, especially because immunizations are easier to administer than other health projects and specific programs have been established especially for this purpose. Infant mortality (per 1000 of births) is the number of infants dying before one year of age in a given year. This number should decrease as foreign aid flows to the health sector increase.

A variety of control variables are included in the model: percentage urban population, number of physicians, gross domestic product (GDP), the Fraser freedom index, and a political freedom index (Freedom House Organization). Gross domestic product, percentage urban population, and the number of physicians were taken from the 2006 World Development Indicators. GDP per capita is based on purchasing power parity and is reported in constant 2000 international dollars. GDP represents the overall level of economic development and should exhibit a positive relationship with human development. The number of physicians (per 1000) is any graduate from a medical school or facility practicing medicine in the country. This should have a positive influence on health, while urban population may provide mixed results.

To control for the institutional environment, I include the Fraser freedom index or the political freedom index in the regression. The Fraser freedom index captures the economic institutions, while the political freedom index controls for political rights and civil liberties. The Fraser freedom index is scaled from 1 to 10 with 10 representing the highest level of freedom. This index measures the degree to which a country allows personal choice over collective choice, voluntary exchange, the freedom to compete, and security of private property (Gwartney and Lawson 2005). The political freedom index is collected from Freedom House (2007) and is scaled from 1 to 7, with 1 representing the highest level of freedom. This index averages scores from an index on political rights and from an index on civil liberties to calculate one comprehensive measure of political freedom. It has been shown that increases in economic and political freedom positively impact economic development (Gwartney, Lawson, and Holcombe 1999; Acemoglu, Johnson, and Robinson 2001, 2002). Thus, a country's institutional environment may influence human development as well and should be included in the analysis.

Because of the importance of controlling for the quality of institutions and the level of income, several different regression specifications are necessary. It is well documented that GDP is highly correlated with institutional indices and are usually not included in the same regression.[2] In my sample, GDP has a correlation of 0.62 with both the Fraser freedom index and with the political freedom index. Including both GDP and either one of the freedom indices may cause inaccurate results; however, it is crucially important that both growth and institutional quality be accounted for in the model specification. Therefore, I estimate my model with five different regression specifications: (1) GDP only, (2) Fraser freedom index only, (3) political freedom index only, (4) both GDP and the Fraser freedom index, and (5) both GDP and the political freedom index. All five regressions include urban population, the number of physicians, and country and year dummies (to eliminate any variation due to country-specific and time-specific effects) as additional control variables.

A panel data set from 1973 to 2004 is constructed and averaged over five-year intervals to control for business cycle fluctuations and measurement error (Boone 1996).[3] Therefore, the data set has seven points in time: 1977, 1982, 1987, 1992, 1997, 2002, and 2004.

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[2] See Acemoglu, Johnson, and Robinson (2001, 2002) and Acemoglu and Johnson (2005) for more discussion of the correlation between GDP and institutional indices.

[3] For example, 1977 is averaged from 1973 to 1977. The time point 2004 is a two-year average covering 2003–2004.

Fixed Effects with Instrumental Variable Estimation

To ensure that endogeneity is not driving my results using the fixed effects model, here I estimate a model that uses fixed effects and an instrumental variable approach to control for potential reverse causality. Because I am specifically analyzing aid to the health sector, it is necessary to implement an instrument for health aid. Aid may be endogenous because of the possibility that the current health in a country more than likely determines the amount of health aid received. Therefore, it is necessary to instrument for this variable.

Past studies have been able to use income, population, and infant mortality as valid instruments (Burnside and Dollar 2000; Ovaska 2003; Djankov, Montalvo, and Reynal-Querol 2005). However, these variables are not valid for my model specification because they would be correlated with the dependent variables. Previous literature has indicated that aid is not given primarily to help the poor, but instead it is given to reflect the special interests of the donors (Mosley 1985a, 1985b; Frey and Schneider 1986; Trumbull and Wall 1994). Another standard instrument in the literature is lagged aid. Boone (1996) shows that lagging aid two periods can be used as a valid instrument for current aid because it will reflect the relatively permanent strategic interests of donors. A potential concern that arises from this instrument is that past health aid could influence the current level of human development. In other words, the instrument would be affecting the dependent variables through channels other than its influence on the current level of health aid. According to the Boone argument, foreign aid should reflect the long-term special and strategic interests of donors, while remaining uncorrelated with the current conditions in recipient countries. This argument is based on the idea that aid is given as a strategic, political move, not necessarily based on need. Thus, the standard instrument from the existing literature that best fits my model is lagged aid.

To provide validity for using lagged aid as an appropriate instrument, it is necessary to use both two- and three-period lags to be overidentified in the first stage.[4] Appendix A provides the results of the first stage for each of the five regressions. These results suggest that both two-period and three-period lagged aid perform as valid instruments in my model. The *F*-test for joint significance between the two instruments ranges from 4.43 to 7.81, depending on the regression specification. This indicates that the instruments are providing predictive power in the first stage. Also, adding strength to this argument are the *F*-statistics for the overall significance of the regression and the *R*-squared coefficient. It is evident that past health aid is highly explanatory in determining current health aid. Of equal importance is the requirement that lagged health aid is not correlated with measures of human development. This is in fact the case. The two-period and three-period lags are uncorrelated with all five human development indicators, as discussed in a later section and presented in Appendix B.

[4] Aid 1977 and 1982 are the instruments for Aid 1992; Aid 1982 and 1987 are the instruments for Aid 1997; Aid 1987 and 1992 are the instruments for Aid 2002; and Aid 1992 and 1997 are the instruments for Aid 2004. Sargan–Hansen tests for overidentifying restrictions are performed to confirm the validity of the instruments. These statistics are insignificant, indicating that the instruments are uncorrelated with the error term and are correctly excluded. The statistics are 0.154, 0.421, 0.591, 0.322, and 0.160 for the regressions including GDP as a control variable, the Fraser freedom index as a control variable, the political freedom index as a control variable, both GDP and the Fraser freedom index as control variables, and both GDP and the political freedom index as control variables, respectively.

The fixed effect model with instrumental variable estimation specification is:

$$Health\ aid_i = \beta L_i + \alpha H_i + u_i$$
$$Y_i = Z_i'\delta + \mu v_i + \varepsilon_i,$$

where $Health\ Aid_i$ = foreign aid specifically to the health sector, L_i = two-period lagged health aid and is the first instrument, and H_i = three-period lagged health aid and is the second instrument. This specification limits by model to four points in time: 1992, 1997, 2002, and 2004.

Descriptive Statistics

The panel data set includes all 208 countries that the World Bank collects data for, even though some of these countries may have a zero value for health aid.[5] Table 1 summarizes the data.

For each variable, the number of observations, mean, standard deviation, minimum, and maximum are provided. I convert health aid to health aid per capita and all other variables control for population. Therefore, it is not necessary to have population on the right side. The log form of health aid, both of the instruments, gross domestic product, number of physicians, death rate, life expectancy, and infant mortality are used in the empirical analysis.[6]

3. Results

Table 2 shows the results for the fixed effects model. Recall that it is necessary to run the model with five different regression specifications to gain a more accurate description. The layout of the table is as follows: column 1 includes GDP as a control variable; column 2 includes the Fraser freedom index as a control variable; column 3 includes the political freedom index as a control variable; column 4 includes both GDP and the Fraser freedom index as control variables; and column 5 includes both GDP and the political freedom index as control variables.

A clear result emerges: Foreign aid specific to the health sector does not significantly improve the overall health in recipient countries, even after controlling for GDP and the quality of institutions. Health aid exhibits the correct sign but is statistically insignificant on life expectancy. The sign switches depending on the regression specification for death rate and both immunizations but is statistically insignificant. Health aid on infant mortality enters with the ''wrong'' sign but remains statistically insignificant. The number of physicians has the most significance throughout the different regression specifications and always enters with the correct sign. GDP and the Fraser freedom index are consistently negative and significant on infant mortality, but do not seem to play a significant role on the other dependent variables. The political freedom index and urban population do not have a significant effect overall on health.

[5] A list of all countries is provided in Appendix C.
[6] See Appendix D for data sources.

Table 1. Summary Statistics

	Observations	Mean	Standard Deviation	Minimum	Maximum
Health foreign aid (per capita)	870	3.75	10.89	0.11	151.89
Log health foreign aid	870	0.19	1.35	−2.19	5.02
Two–period lagged health aid (IV)	560	2.59	5.63	0.11	53.15
Log two-period lagged health aid (IV)	565	1.32	1.83	−5.30	5.95
Three-period lagged health aid (IV)	417	2.80	6.58	0.11	52.25
Log three-period lagged health aid (IV)	417	−0.02	1.30	−2.19	3.96
Fraser freedom index	756	5.72	1.29	1.72	9.09
Political freedom index	1211	3.83	2.00	1.00	7.00
GDP per capita	1065	7925.87	8296.44	483.53	62,970.00
Log GDP per capita	1065	8.42	1.11	6.18	11.05
Urban population (percent)	1435	51.05	24.82	3.25	100.00
Numbers of physicians (per 1000)	1029	1.26	1.36	0.01	17.44
Log number of physicians	1029	−0.57	1.52	−4.96	2.86
Immunizations—DPT (%)	1019	72.81	25.27	1.00	99.00
Immunizations—measles (%)	1001	71.12	24.70	0.33	99.00
Private health expenditures (%)	374	2.45	1.43	0.09	9.36
Prevalence of HIV (%)	281	2.84	6.35	0.10	38.80
Death rate (per 1000)	1339	10.41	5.18	1.34	40.00
Log death rate	1339	2.23	0.48	0.30	3.69
Infant mortality (per 1000)	1206	55.12	45.74	2.40	200.00
Log infant mortality	1206	3.56	1.06	0.88	5.30
Life expectancy	1322	64.11	11.18	27.43	81.74
Log life expectancy	1322	4.14	0.19	3.31	4.40
Foreign aid (per capita)	1069	77.02	201.44	0.00	2189.95
Log foreign aid	1054	3.15	1.62	0.00	7.69
Two-period lagged aid (IV)	1067	77.14	201.61	0.00	2189.95
Log two-period lagged aid (IV)	1052	3.15	1.63	0.00	7.69
Three-period lagged aid (IV)	1066	77.18	201.71	0.00	2189.95
Log three-period lagged aid (IV)	1051	3.15	1.63	0.00	7.69

Based on five-year averages.

In general, health foreign aid does not have the effect proposed by those who advocate its need to increase human development in developing countries. This table suggests that foreign aid to the health sector is ineffective at improving health in recipient countries. To determine these results more definitively, I implement an instrumental variable estimation to control for reverse causality. Recall that my two instruments for health aid are a two-period lag and a three-period lag of health aid. The first stage results are presented in Appendix A. All exogenous variables that enter into the second stage also enter into the first, including both country and year dummies.

The results of the fixed effects model with instrumental variable estimation are presented in Table 3. The results from this reestimation uniformly confirm my previous results. After controlling for reverse causality, health aid has no significant impact on the health indicators. In three out of the five regressions, health aid enters with the wrong sign on both life expectancy and the death rate, but remains insignificant in all of the regressions. Most of the other control variables are also insignificant on both life expectancy and the death rate. Health aid has the correct sign on infant mortality but is insignificant in all five regressions, while GDP is negatively and significantly impacting infant mortality in two out of three regressions. For

Table 2. The Impact of Health Aid on Human Development Indicators

Fixed Effects Model Benchmark Specification															
	Dependent Variable: Life Expectancy					Dependent Variable: Infant Mortality					Dependent Variable: Death Rate				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	0.011**	0.006	0.010**	0.010	0.019	0.007	0.017	0.018*	0.005	0.007	−0.027**	−0.023	0.026***	−0.028	−0.027**
	(0.005)	(0.006)	(0.004)	(0.007)	(0.004)	(0.108)	(0.015)	(0.011)	(0.014)	(0.011)	(0.012)	(−0.014)	(0.010)	(0.016)	(0.011)
GDP (per capita)	0.026	—	—	0.051**	0.026	−0.300***	—	—	−0.339***	−0.300***	0.018	—	—	−0.015	0.015
	(0.025)			(0.024)	(0.025)	(0.061)			(0.068)	(0.061)	(0.055)			(0.059)	(0.056)
Fraser freedom index	—	0.011	—	0.011	—	—	−0.073***	—	−0.048***	—	—	−0.021	—	−0.028*	—
		(0.008)		(0.008)			(0.016)		(0.016)			(0.017)		(0.017)	
Political freedom index	—	—	−0.001	—	−0.002	—	—	0.003	—	0.005	—	—	−0.001	—	−0.001
			(0.004)		(0.004)			(0.011)		(0.011)			(0.009)		(0.010)
Urban population	0.00005	−0.002	−0.0002	−0.002	0.00002	0.001	0.008	0.0001	0.009*	0.001	−0.004	0.004	−0.003	0.003	−0.004
	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Number of physicians	0.025**	0.036***	0.021***	0.026*	0.024**	−0.037	−0.104***	−0.080***	−0.051	−0.038	−0.062***	−0.086***	−0.045**	−0.079**	−0.062***
	(0.010)	(0.014)	(0.008)	(0.014)	(0.010)	(0.025)	(0.036)	(0.025)	(0.034)	(0.025)	(0.042)	(0.032)	(0.020)	(0.034)	(0.022)
Constant	3.730***	4.440***	4.149***	3.565***	4.080***	6.662***	1.986***	2.756***	6.392***	6.640***	1.177	0.634	2.185***	2.878***	1.210
	(0.180)	(0.239)	(0.033)	(0.190)	(0.320)	(0.438)	(0.559)	(0.467)	(0.522)	(0.444)	(0.738)	(0.570)	(0.077)	(0.449)	(0.743)
R-squared	0.91	0.91	0.91	0.91	0.91	0.97	0.97	0.97	0.98	0.97	0.92	0.92	0.92	0.93	0.92
No. observations	599	437	663	424	595	586	428	646	416	586	601	437	663	424	597

	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	0.055	1.174*	0.672	1.289	0.056	0.055	0.019	−0.208	0.122	−0.283
	(0.632)	(0.670)	(0.618)	(0.719)	(0.635)	(0.632)	(0.785)	(0.613)	(0.819)	(0.649)
GDP (per capita)	−4.511	—	—	−1.689	−4.551	4.234	—	—	3.178	4.271
	(3.061)			(3.394)	(3.068)	(3.061)			(5.056)	(4.127)
Fraser freedom index	—	−0.162	—	1.219	—	—	0.832	—	1.316	—
		(0.954)		(0.859)			(1.001)		(0.915)	
Political freedom index	—	—	1.067	—	0.318	—	—	1.737**	—	1.205
			(0.686)		(0.685)			(0.735)		(0.795)
Urban population	0.193	−0.264	0.141	−0.160	0.200	0.006	−0.357	−0.062	−0.316	0.032
	(0.223)	(0.246)	(0.226)	(0.249)	(0.227)	(0.243)	(0.314)	(0.241)	(0.314)	(0.240)
Number of physicians	1.204	2.818	−0.343	2.858	1.163	2.652*	5.769***	1.885	5.456***	2.491*
	(1.366)	(1.731)	(1.308)	(1.826)	(1.368)	(1.425)	(1.935)	(1.435)	(1.967)	(1.432)

Table 2. Continued

	Fixed Effects Model Benchmark Specification									
	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	90.111***	80.761***	51.808***	83.324***	88.802***	56.038***	125.696***	54.712***	26.128	48.074***
	(21.860)	(21.888)	(4.531)	(24.472)	(21.960)	(48.250)	(32.632)	(4.929)	(35.838)	(48.692)
R-squared	0.90	0.88	0.89	0.89	0.90	0.88	0.86	0.88	0.87	0.88
No. observations	540	399	602	388	540	533	392	595	382	533

Standard errors are in parentheses. Country and year effects are included in the regressions; column 1 includes GDP as a control variable; column 2 includes the Fraser freedom index as a control variable; column 3 includes the political freedom index as a control variable; column 4 includes GDP and the Fraser freedom index as control variables; column 5 includes GDP and the political freedom index as control variables.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Table 3. The Impact of Health Aid on Human Development Indicators

Fixed Effects with Instrumental Variable Estimation Main Results															
	Dependent Variable: Life Expectancy					Dependent Variable: Infant Mortality					Dependent Variable: Death Rate				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	0.015	−0.003	−0.0002	−0.001	0.013	−0.035	−0.052	−0.058	−0.043	−0.033	−0.014	0.038	0.034	0.030	−0.089
	(0.023)	(0.033)	(0.028)	(0.033)	(0.022)	(0.043)	(0.064)	(0.054)	(0.062)	(0.042)	(0.047)	(0.073)	(0.063)	(0.070)	(0.045)
GDP (per capita)	−0.025	—	—	0.02	−0.023	−0.337***	—	—	−0.433***	−0.338	0.105	—	—	0.056	0.099
	(0.059)			(0.068)	(0.059)	(0.104)			(0.143)	(0.106)	(0.126)			(0.159)	(0.129)
Fraser freedom index	—	0.007	—	0.007	—	—	−0.006	—	0.004	—	—	−0.025	—	−0.026	—
		(0.013)		(0.013)			(0.030)		(0.026)			(0.027)		(0.027)	
Political freedom index	—	—	0.006	—	0.004	—	—	−0.004	—	−0.003	—	—	−0.019	—	−0.012
			(0.010)		(0.011)			(0.019)		(0.019)			(0.024)		(0.023)
Urban population	0.003	−0.0003	0.004	−0.0002	0.004	0.007	0.021*	0.009	0.020*	0.007	−0.004	0.005	−0.009	0.006	−0.005
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.008)	(0.013)	(0.009)	(0.011)	(0.008)	(0.007)	(0.011)	(0.009)	(0.012)	(0.008)
Number of physicians	0.00005	−0.014	−0.008	−0.020	−0.001	0.028	0.021	0.017	0.049	0.029	−0.013	0.025	0.009	0.030	−0.010
	(0.014)	(0.020)	(0.014)	(0.023)	(0.014)	(0.027)	(0.052)	(0.028)	(0.052)	(0.028)	(0.029)	(0.040)	(0.031)	(0.045)	(0.045)
Constant	4.332***	4.274	3.848***	4.075***	4.097***	6.880***	0.494	4.290***	4.884***	6.741***	6.035*	2.344***	2.507	1.865	2.317*
	(0.532)	(0.328)	(0.365)	(0.766)	(0.480)	(0.827)	(0.947)	(0.171)	(1.441)	(1.008)	(3.608)	(0.748)	(0.232)	(1.797)	(1.340)
R-squared	0.94	0.94	0.94	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.95	0.95	0.95	0.95	0.95
No. observations	272	212	292	207	272	273	212	295	207	273	273	212	295	207	273

	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	−3.118	−3.737	−4.209	−3.536	−3.270	−3.448	−3.116	−4.296	−3.056	−3.499
	(2.822)	(3.479)	(3.565)	(3.634)	(2.297)	(2.746)	(3.332)	(3.539)	(3.444)	(2.838)
GDP (per capita)	4.376	—	—	6.370	4.587	3.090	—	—	2.906 7.242	3.162
	(6.337)			(7.956)	(6.463)	(6.517)				(6.634)
Fraser freedom index	—	3.317**	—	3.005*	—	—	3.707**	—	3.505**	—
		(1.582)		(1.545)			(1.483)		(1.464)	
Political freedom index	—	—	0.347	—	0.347	—	—	0.091	—	0.118
					(1.269)			(1.157)		(1.167)
Urban population	0.779*	0.633	0.746	0.627	0.816*	0.491	0.350	0.406	0.335	0.504
	(0.457)	(0.642)	(0.492)	(0.621)	(0.475)	(0.373)	(0.510)	(0.427)	(0.497)	(0.398)
Number of physicians	1.795	5.228**	2.144	4.562	1.717	2.413	5.066**	3.011*	5.029**	2.368
	(1.696)	(2.498)	(1.592)	(2.844)	(1.717)	(1.565)	(1.980)	(1.537)	(2.302)	(1.605)

Table 3. Continued

Fixed Effects with Instrumental Variable Estimation Main Results										
	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	−8.227	11.682	57.940***	−44.248	21.819	25.466	33.984	69.867***	9.087	42.645
	(66.435)	(53.132)	(9.022)	(85.001)	(52.897)	(66.189)	(41.996)	(9.218)	(78.632)	(53.684)
R-squared	0.88	0.89	0.88	0.89	0.88	0.87	0.89	0.86	0.89	0.87
No. observations	272	211	295	206	272	272	211	295	206	272

Standard errors are in parentheses. Country and year effects are included in the regressions; column 1 includes GDP as a control variable; column 2 includes the Fraser freedom index as a control variable; column 3 includes the political freedom index as a control variable; column 4 includes GDP and the Fraser freedom index as control variables; column 5 includes GDP and the political freedom index as control variables.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

example, in regression 1, a 1% increase in GDP per capita would translate into lowering infant mortality by 0.337%. For both measles immunizations and DPT immunizations, health aid has a negative, but insignificant impact. The Fraser freedom index always has a positive and significant impact on these two variables. In all regression specifications, a one unit increase in this index would increase immunizations between 3 and 4%. The number of physicians only matters for a few regression specifications for immunizations. Both the political freedom index and urban population remain insignificant.

This core analysis supports my baseline specification, suggesting that foreign aid is ineffective at improving human development. Because of the important conclusions to be drawn from this analysis, I implement three different robustness checks to the main specification: (1) the inclusion of additional control variables, (2) a reestimation of the main model replacing health aid with general foreign aid, and (3) a semireduced form of the main model to include lagged aid as an explanatory variable.

4. Robustness Checks

To ensure the validity of the previous results, I provide three robustness checks. Because of data restrictions in the panel regressions, the analysis is limited in control variables. To relax this restriction, I constructed a limited data set from my original to allow the inclusion of two additional controls that were not in the previous regressions. The second robustness check replaces foreign aid to the health sector with general foreign aid. The third check provides support that my instruments are valid by running the model with lagged aid as an explanatory variable. All robustness checks confirm my original results. The results from the robustness checks are omitted to save space, but they are available from the author on request.

Robustness Check 1: Additional Control Variables

The five regressions from the main fixed effects model with instrumental variable estimation are reestimated to allow for additional controls to provide a robustness check. Because of data restrictions, factors that could be affecting human development were not included previously. Therefore, I create a smaller data set to allow for the inclusion of two more control variables that could significantly affect human development. Because of data limitations, the inclusion of these additional controls significantly lowers the number of observations. Private health expenditures and the prevalence of HIV are included in this specification. Private spending on health should play a vital role on the health indicators in the analysis. Also, one would expect that the HIV epidemic that exists in many developing countries would significantly affect human development.

The results support my previous two estimations, even after the inclusion of additional control variables. This continues to suggest that foreign aid to the health sector is not a strong determinant of human development. Most of the other control variables lose significance in this specification.

Robustness Check 2: Replacing Health Aid with Overall Foreign Aid

One criticism of using health aid as the main variable of interest is that health aid only accounts for 7% of all foreign aid given. Therefore, the reason health aid is not having an impact may be that the amount given is not actually large enough. For example, the maximum per capita amount of health aid in my sample is $152, while the maximum per capita amount of general aid (including health aid) is $2200. Potentially, health aid may also perform differently than other types of aid. To combat these arguments, I reran the fixed effects model with instrumental variable estimation replacing health aid with overall foreign aid.

In all five regression specifications, across all dependent variables, the insignificance of aid remains. Foreign aid has the correct sign on life expectancy, the death rate, and infant mortality, but remains insignificant. In one out of two regressions, the Fraser freedom index significantly reduces infant mortality and the death rate. In three out of four regressions, it significantly increases immunizations. GDP significantly reduces infant mortality in all three regressions. The number of physicians does play an important role in improving these health indicators.

Robustness Check 3: Health Aid as an Explanatory Variable

A potential concern with my instrumental variable approach is that lagged aid may be affecting human development through channels other than current health aid. One way to circumvent this problem is to examine the semireduced form specification, where health aid is instrumented with the two-period lag, but the three-period lag enters the second stage directly (Acemoglu and Johnson 2005). To perform this specification effectively, I use three-year averages instead of five-year averages to create more periods (11 vs. 7 periods in the original data set).[7]

As presented in Appendix B, the results indicate that lagged health aid is not significantly affecting the variables of interest. In most of the regression specifications, lagged health aid enters with the incorrect sign, but always remains insignificant across all regression specifications. Most of the other control variables perform as in previous estimations. This result lends support to the validity of instrumenting with lagged aid.

5. Conclusion

The empirical analysis suggests that health aid is ineffective at improving human development, supporting other works within public choice and development literature. There is a lack of evidence to indicate that health aid should be pursued as a policy objective to promote increases in human welfare. In this sense, health is not "special" relative to other forms of development assistance. Just like general aid, which is shown to have an insignificant effect on economic development, aid used specifically for health goals has an insignificant effect on human development.

[7] Both the original fixed effects model and the instrumental variable model were reestimated with three-year averages and the result did not change. Therefore, they have not been reported to save space.

This paper is the first to empirically test the effectiveness of aid specifically to the health sector. I develop and test a fixed effects model controlling for reverse causality that demonstrates the inability of foreign aid to translate into significant results. These results are robust to different model specifications, including replacing health aid with overall foreign aid and using lagged aid as an explanatory variable. These results suggest that foreign aid to the health sector is not establishing real effects in human development. Despite this argument, the development community pushes for the advancement of society by increasing foreign aid. My results suggest that international aid is not one of the most powerful weapons against poverty, as suggested by the 2005 Human Development Report. Thus, it may not be able to end extreme poverty or facilitate human development, as argued by those authors from the public interest viewpoint.

With these results, we are still left questioning what will help improve the quality of life in developing countries. My findings weakly suggest an important role for institutions in determining human development, as captured by the Fraser freedom index. This indicates an avenue for future research in determining whether health is an outcome, rather than an input, of development. It may be worthwhile to investigate the connection between institutions, economic development, and human development and the channels through which each operates.

Appendix A. First Stage Results for Health Foreign Aid

	Dependent Variable: Health Aid				
	(1)	(2)	(3)	(4)	(5)
Two-period lagged health aid (IV)	−0.211*** (0.070)	−0.115 (0.080)	−0.184*** (0.069)	−0.138* (0.081)	−0.210*** (0.071)
Three-period lagged health aid (IV)	−0.209*** (0.067)	−0.253*** (0.077)	−0.138** (0.067)	−0.246*** (0.077)	−0.208*** (0.067)
F-statistic	3.90	4.22	4.02	4.24	3.84
Joint *F*-statistic	7.81	6.85	4.43	7.04	7.48
R-squared	0.53	0.56	0.55	0.57	0.53
# observations	272	212	294	207	272

Standard errors are in parentheses. Country and year effects are included in the regressions; column 1 includes GDP as a control variable; column 2 includes the Fraser freedom index as a control variable; column 3 includes the political freedom index as a control variable; column 4 includes GDP and the Fraser freedom index as control variables; column 5 includes GDP and the political freedom index as control variables.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Appendix B. The Impact of Health Aid on Human Development Indicators

Fixed Effects with Instrumental Variable Estimation Semireduced Form (3-year averages)															
	Dependent Variable: Life Expectancy					Dependent Variable: Infant Mortality					Dependent Variable: Death Rate				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	−0.033	−0.030	−0.042	−0.032	−0.034	0.017	0.012	−0.032	0.087	−0.006	0.100	0.132	0.122	0.131	0.105
	(0.033)	(0.035)	(0.037)	(0.033)	(0.034)	(0.235)	(0.359)	(0.183)	(0.319)	(0.225)	(0.106)	(0.132)	(0.116)	(0.118)	(0.108)
Three-period lagged health aid	−0.005	−0.01	−0.006	−0.009	−0.005	0.020	0.039	0.017	0.049	0.015	0.004	0.013	0.005	0.015	0.005
	(0.004)	−0.006	−0.005	−0.006	(0.004)	(0.028)	(0.053)	(0.023)	(0.049)	(0.027)	(0.011)	(0.018)	(0.013)	(0.018)	(0.012)
GDP (per capita)	0.042	—	—	0.007	0.047	−0.351***	—	—	−0.331	−0.412****	0.016	—	—	0.146	0.019
	(0.030)			−0.045	(0.034)	(0.087)			(0.222)	(0.086)	(0.095)			(0.149)	(0.105)
Fraser freedom index	—	0.013	—	0.016*	—	—	−0.036	—	−0.024	—	—	−0.040	—	−0.053*	—
		(0.009)		(0.009)			(0.037)		(0.038)			(0.025)		(0.028)	
Political freedom index	—	—	0.003	—	0.001	—	—	−0.004	—	−0.002	—	—	−0.005	—	−0.001
			−0.005		(0.005)			(0.014)		(0.014)			(0.016)		(0.015)
Urban population	0.002	−0.0004	0.001	0.0004	0.002	0.007	0.012	0.009	0.009	0.008	−0.005	0.003	−0.003	0.001	−0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.013)	(0.012)	(0.011)	(0.010)	(0.012)	(0.008)	(0.010)	(0.008)	(0.010)	(0.008)
Number of physicians	0.001	0.006	0.001	0.002	0.001	0.004	−0.042	−0.014	−0.009	0.010	−0.007	0.012	0.005	0.004	−0.005
	(0.010)	(0.017)	(0.012)	(0.015)	(0.011)	(0.028)	(0.065)	(0.031)	(0.045)	(0.030)	(0.027)	(0.046)	(0.030)	(0.039)	(0.028)
Constant	3.677	4.135***	4.022***	4.203***	3.643***	5.851***	2.542	3.879***	5.176***	6.194***	2.242**	2.077**	2.345***	0.345	2.208*
	(0.356)	(0.316)	(0.287)	(0.451)	(0.385)	(0.763)	(1.949)	(0.828)	(1.347)	(1.040)	(1.065)	(0.930_	(0.765)	(1.557)	(1.161)
R-squared	0.93	0.93	0.91	0.93	0.93	0.98	0.98	0.98	0.98	0.98	0.83	0.90	0.90	0.90	0.91
No. observations	457	346	474	340	443	318	239	328	234	311	453	346	474	340	445

	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Health aid (per capita)	−7.003	−4.448	−7.325	−4.496	−6.235	−0.309	3.303	−1.079	2.706	0.817
	(5.901)	(6.013)	(6.204)	(5.489)	(5.575)	(4.389)	(5.298)	(4.546)	(4.856)	(4.268)
Three-period lagged health aid	−0.010	−0.815	−0.233	−0.726	−0.032	0.488	0.108	0.022	0.479	0.561
	(0.741)	(0.880)	(0.741)	(0.908)	(0.721)	(0.609)	(0.837)	(0.603)	(0.825)	(0.604)
GDP (per capita)	−1.167	—	—	−3.281	0.740	9.962*	—	—	10.248	13.137**
	(5.252)			(6.620)	(5.414)	(5.799)			(7.430)	(5.870)

Appendix B. Continued

Fixed Effects with Instrumental Variable Estimation Semireduced Form (3-year averages)										
	Dependent Variable: Immunizations—DPT					Dependent Variable: Immunizations—Measles				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Fraser freedom index	—	2.687*	—	3.612**	—	—	0.983	—	1.344	—
		(1.485)		(1.521)			(1.395)		(1.323)	
Political freedom index	—	—	−0.426	—	−0.609	—	—	0.078	—	−0.200
			(1.020)		(0.961)			(0.862)		(0.845)
Urban population	0.350	0.114	0.074	0.229	0.255	−0.480	−0.730*	−0.616	−0.591	−0.516
	(0.437)	(0.483)	(0.432)	(0.491)	(0.419)	(0.392)	(0.440)	(0.371)	(0.461)	(0.381)
Number of physicians	0.546	0.184	−0.255	0.252	0.246	1.773	4.917**	1.759	3.800*	1.661
	(1.603)	(2.110)	(1.671)	(2.136)	(1.582)	(1.380)	(2.133)	(1.488)	(1.970)	(1.444)
Constant	63.723	13.242	93.563***	17.449	64.173	−11.741	120.320***	105.153***	−7.846	−20.568
	(46.282)	(48.418)	(23.731)	(63.402)	(48.210)	(47.521)	(44.346)	(36.236)	(63.971)	(46.699)
R-squared	0.83	0.85	0.82	0.85	0.84	0.86	0.84	0.85	0.85	0.86
No. observations	453	344	470	338	442	452	343	469	337	441

Standard errors are in parentheses. Country and year effects are included in the regressions; column 1 includes GDP as a control variable; column 2 includes the Fraser freedom index as a control variable; column 3 includes the political freedom index as a control variable; column 4 includes GDP and the Fraser freedom index as control variables; column 5 includes GDP and the political freedom index as control variables.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Appendix C. List of Countries in Analysis

All Countries			
Afghanistan	Djibouti	Latvia	Russian Federation
Albania	Dominica	Lebanon	Rwanda
Algeria	Dominican Republic	Lesotho	Samoa
American Samoa	Ecuador	Liberia	San Marino
Andorra	Egypt, Arab Rep.	Libya	Sao Tome and Principe
Angola	El Salvador	Liechtenstein	Saudi Arabia
Antigua and Barbuda	Equatorial Guinea	Lithuania	Senegal
Argentina	Eritrea	Luxembourg	Serbia and Montenegro
Armenia	Estonia	Macao, China	Seychelles
Aruba	Ethiopia	Macedonia, FYR	Sierra Leone
Australia	Faeroe Islands	Madagascar	Singapore
Austria	Fiji	Malawi	Slovak Republic
Azerbaijan	Finland	Malaysia	Slovenia
Bahamas, The	France	Maldives	Solomon Islands
Bahrain	French Polynesia	Mali	Somalia
Bangladesh	Gabon	Malta	South Africa
Barbados	Gambia, The	Marshall Islands	Spain
Belarus	Georgia	Mauritania	Sri Lanka
Belgium	Germany	Mauritius	St. Kitts and Nevis
Belize	Ghana	Mayotte	St. Lucia
Benin	Greece	Mexico	St. Vincent and the Grenadines
Bermuda	Greenland	Micronesia, Fed. Sts.	Sudan
Bhutan	Grenada	Moldova	Suriname
Bolivia	Guam	Monaco	Swaziland
Bosnia and Herzegovina	Guatemala	Mongolia	Sweden
Botswana	Guinea	Morocco	Switzerland
Brazil	Guinea–Bissau	Mozambique	Syrian Arab Republic
Brunei	Guyana	Myanmar	Tajikistan
Bulgaria	Haiti	Namibia	Tanzania
Burkina Faso	Honduras	Nepal	Thailand
Burundi	Hong Kong, China	Netherlands	Timor–Leste
Cambodia	Hungary	Netherlands Antilles	Togo
Cameroon	Iceland	New Caledonia	Tonga
Canada	India	New Zealand	Trinidad and Tobago
Cape Verde	Indonesia	Nicaragua	Tunisia
Cayman Islands	Iran, Islamic Rep.	Niger	Turkey
Central African Republic	Iraq	Nigeria	Turkmenistan
Chad	Ireland	Northern Mariana Islands	Uganda
Channel Islands	Isle of Man	Norway	Ukraine
Chile	Israel	Oman	United Arab Emirates
China	Italy	Pakistan	United Kingdom
Colombia	Jamaica	Palau	United States
Comoros	Japan	Panama	Uruguay
Congo, Dem. Rep.	Jordan	Papua New Guinea	Uzbekistan
Congo, Rep.	Kazakhstan	Paraguay	Vanuatu
Costa Rica	Kenya	Peru	Venezuela, RB
Cote d'Ivoire	Kiribati	Philippines	Vietnam
Croatia	Korea, Dem. Rep.	Poland	Virgin Islands (U.S.)
Cuba	Korea, Rep.	Portugal	West Bank and Gaza
Cyprus	Kuwait	Puerto Rico	Yemen, Rep.
Czech Republic	Kyrgyz Republic	Qatar	Zambia
Denmark	Lao PDR	Romania	Zimbabwe

Appendix D. Data Sources

Variable	Source
Health foreign aid	Credit Reporting System, OECD
Foreign aid to health sector	World Bank 2006
GDP per capita	World Bank 2006
Infant mortality	World Bank 2006
Death rate	World Bank 2006
Life expectancy	World Bank 2006
Immunizations—DPT	World Bank 2006
Immunizations—measles	World Bank 2006
Percent urban population	World Bank 2006
Number of physicians	World Bank 2006
Private health expenditures	World Bank 2006
HIV prevalence	World Bank 2006
Political freedom index	Freedom House Organization
Fraser freedom index	Fraser Institute

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