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H N P D I S C U S S I O N P A P E R

WHY DO SOME COUNTRIES SPEND MORE FOR HEALTH?

An Assessment of Sociopolitical Determinants and International Aid for Government Health Expenditures

Li-Lin Liang and Andrew J Mirelman

January 2014

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WHY DO SOME COUNTRIES SPEND MORE FOR HEALTH?

AN ASSESSMENT OF SOCIOPOLITICAL DETERMINANTS AND INTERNATIONAL AID FOR GOVERNMENT HEALTH EXPENDITURES

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Abstract: A consensus exists that rising income levels and technological development are among the key drivers of total health spending. However, determinants of public sector health expenditure are less well understood. This study examines a complex relationship across government health expenditure (GHE), sociopolitical risks, and international aid, while taking into account the impact of national income and fiscal capacity on health spending. We apply a two-way fixed effects and two-stage least squares regression method to a panel dataset comprising 120 countries for the years 1995 through 2010.

Our results show that democratic accountability has a diminishing positive correlation with GHE, and that levels of spending are higher when the government is more stable. Corruption is associated with less spending in developing countries, but with more spending in high-income countries. Furthermore, we find that development assistance for health (DAH) substitutes for domestically financed government health expenditure (DGHE). For an average country, a 1 percent increase in total DAH or DAH to government is associated with a 0.02 percent decrease in DGHE. However, we do not find DAH to nongovernmental bodies (NGOs) is fungible with DGHE. In addition, we discover that the degree of fungibility of DAH to government is higher in countries where corruption and ethnic tensions are widespread.

Our work highlights that policy reforms that aim to eliminate corruption are fundamental to improving the capacity of developing countries to scale up GHE, and to increasing the efficiency of health care systems in developed countries in containing health care costs. To minimize fungibility, donors may impose stronger monitoring mechanisms for corruption. Delivering aid through NGOs may be an option in countries with high ethnic tensions; however, the ability to do so depends on institutional arrangements and the capacity of NGOs in individual countries.

Keywords: Health expenditure, governance, democracy, corruption, aid, panel data, instrumental variables, developing countries.

Disclaimer: The findings, interpretations, and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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1. INTRODUCTION

Rising income levels and technological development are among the key drivers of total spending on health. However, public sector health spending is likely to be determined by factors related to governance quality and social risks, hereafter referred to as "sociopolitical risks." Sociopolitical risks can present serious challenges to emerging economies that are in the process of economic and political transition. This holds true because the less developed a country, the more likely that its sociopolitical institutions will be weak (Mills 2011). Weak governance and social instability limit effective functioning of health systems and jeopardize the ability of governments to mobilize health funds. The World Health Organization (WHO) urges low-income countries to raise tax revenues for health by 2 percent of their gross national product by 2015, and middle-income countries to increase public funding to extend coverage for poor households (WHO 2001). In this context, it is useful to examine whether sociopolitical risks explain public spending on health in the developing world.

Furthermore, many developing countries rely on foreign aid to promote economic growth and social welfare. Development assistance for health (DAH) grew rapidly during 2001–10, at an annual rate of 11.2 percent, contributing to progress toward achieving Millennium Development Goals (IHME 2012). Nevertheless, there are concerns about external dependence for health financing (Mills 2011). While an increase in health aid raises public spending on health, foreign aid also incentivizes recipient countries to reallocate domestic resources among various sectors. If a government substitutes DAH for domestically financed health funds, there will be a decrease to that extent of government's contribution to the domestic health budget (Farag et al. 2009).

Developed countries generally have more stable governance, but they also face a need to contain the growth of public sector health spending (OECD 2010). Since 1970, two-thirds of the increase in per capita total health expenditure in developed economies results from increases in government health expenditure (GHE) (Coady and Kashiwase 2012). Organization for Economic Co-operation and Development (OECD) experts have proposed various policies that aim to contain health expenditure growth, including improving efficiency in health systems and public sector management and coordination (Joumard et al. 2010; Tyson et al. 2012). The effectiveness of these policy tools is likely to depend on the quality of overall governance. Consequently, investigating how

sociopolitical factors contribute to public sector health expenditure in developed nations should be beneficial to ongoing reform efforts.

This paper assesses empirical linkages between public spending on health with various sociopolitical determinants and health aid. We break down governance into three domains — government stability, corruption, and democratic accountability — and focus on social risk in relation to ethnic tensions. Because of difficulties scholars have experienced in assembling data on countries' sociopolitical environments at the global level, there has been a lack of systematic analysis of the relationship between governance and public sector health spending. This study covers 120 countries over the periods 1995 through 2010, thus improving on previous research using smaller samples.

2. RELATED LITERATURE

The standard approach to analyzing aggregate health expenditure looks at how it changes with national income. This method was pioneered by Newhouse (1977) and developed further by Leu (1986) and by Hitiris and Posnett (1992). An alternative approach looks at the political determinants of health expenditure, examining the "institutions of government" and the effects of various political systems (Navarro et al. 2006; Persson and Tabellini 1999; Shelton 2007; Vatter and Rüefli 2003).

Our work is related to the second strand of literature. While we investigate political variables that have previously been studied by others, we use measures for them, which are available for both developed and developing countries. Looking at high-income countries, Huber (1998) and Vatter and Rüefli (2003) use variables for government stability defined by cabinet stability and by coalition size. Both conclude that a more stable government is less prone to short-term policy expansions such as guarantees of increased social expenditure, and that a broader coalition government may keep health expenditures down through greater stability.

Corruption affects expenditure in that political rents can be obtained from direct appropriation of tax revenue or favors paid to interest groups (Alesina et al. 2008). Higher levels of corruption are likely to be associated with higher military spending and lower public-sector expenditure on health and education (Delavallade 2006; Fosu 2008; Goel and Nelson 1998; Gupta et al. 2000; Gupta et al. 2001; Mauro 1998; Tanzi and Davoodi 1997). Further examination finds that greater executive restraint would reduce

corruption and thus shift expenditure away from public investment that has low productivity (Fosu 2010; Keefer and Knack 2007). A separate variable for democratic accountability has had a varying relationship with health expenditure. Some studies show democratic societies allocating a higher share of the public budget to health, and others show veto points curbing social expenditure are exercised in direct democracies (Baqir 2002; Farag et al. 2012; Habibi 1994; Persson and Tabellini 1999; Vatter and Rüefli 2003).

There is little empirical evidence relating social risk to ethnic tensions. Some researchers have found that more ethnically heterogeneous societies spend less on public goods, including health and education (Easterly and Levine 1997; Kuijs 2000). But those studies have not specifically focused on ethnic tensions.

For external aid, a key question of interest has been whether it is fungible with domestic revenue sources financing health expenditures. A number of studies report that DAH has fungibility (Gbesemete and Gerdtham 1992; Murthy and Okunade 2009; Xu et al. 2011). Fairbank (2013) concludes that the primary factors influencing fungibility for a country are the number of donors and the importance of aid relative to other national income. There is some evidence that fungibility is more likely when external aid is provided to government rather than to nongovernment organizations (NGOs) (Lu et al. 2010). There is a gap in the literature regarding interaction of sociopolitical risks with fungibility.

3. MODELS OF GOVERNMENT HEALTH EXPENDITURE

3.1 Basic fixed-effects regressions

To incorporate health aid in models for government health expenditure (GHE), we start by specifying a simple relationship:

$$TGHE=DGHE+DAH\_G \qquad (1.1)$$

where TGHE is total government health expenditure, financed from both domestic and external sources; DGHE is domestically financed government health expenditure; and DAH_G is DAH or development assistance for health disbursed to government. DAH may also be channeled through nongovernmental bodies, and thus we divide it according to delivery channels as follows:

Total DAH=DAH_G+DAH_NG+DAH_U (1.2)

DAH_NG denotes DAH distributed to NGOs; DAH_U is DAH that cannot be disaggregated into recipient agencies. Following this discussion, we separate TGHE and DGHE and propose a model for each, where we include additional variables for health aid in the DGHE function to investigate fungibility of aid.

The basic model of TGHE for country *i* (1, …, N) at year *t* (1, …, T) is the following:

$$\log TGHE_{it} = \beta_1 \log GDP_{it} + \beta_2 \log GGD_{it} + \beta_3 Informal_{it} + \beta_4 \log Old_{it} + \sum_j \vartheta_j Sociopolitical\ risk_{jit} + \varepsilon_{it} \quad (1.3)$$

where

$$\varepsilon_{it} = f_i + u_t + e_{it} \quad (1.4)$$

GDP_{it} represents gross domestic product (GDP); GGD_{it} is government gross debt (GGD). $Informal_{it}$ is the size of the informal sector and Old_{it} is the share of population age 65 and over. GGD_{it} measures debt financing. GGD_{it} and $Informal_{it}$ are included to capture variations in governments' fiscal capacities. We conjecture that governments that have borrowed more money and can collect more tax revenue would have more financial resources to fund health care. We expect a negative coefficient for $Informal_{it}$ since a larger informal sector will tend to reduce the tax base and hence tax revenue. Old_{it} is likely to have a positive coefficient as older people generally consume more medical resources than young people.

The term $Sociopolitical\ risk_{jit}$ is the term we apply to a set of four variables, namely "government stability," "less corruption," "democratic accountability," and "less ethnic tensions." Each of these variables is given a score between 0 and 1 (1 indicating the best performance), which was converted from points assigned by the International Country Risk Guide (ICRG) (PRS 2012). Definitions for these variables appear in section 4.

The composite disturbance term ε_{it} is the sum of country-specific effects (f_i), time effects (u_t) measured by year dummies, and idiosyncratic error (e_{it}). Country effects capture a country's initial level of spending and persistent heterogeneity, including characteristics of their health financing and delivery system. Time effects account for

technological progress, global economic crises, and other time-varying factors common across nations.

The model for DGHE proposed as a counterpart for equation (1.3) has additional variables for health aid and takes the following form:

$$\log DGHE_{it} = \gamma_1 \log GDP_{it} + \gamma_2 \log GGD_{it} + \gamma_3 Informal_{it} + \gamma_4 \log Old_{it} + \gamma_5 DAH\_G_{it} + \gamma_6 DAH\_NG_{it} + \sum_j \omega_j Sociopolitical\ risk_{jit} + \epsilon_{it} \quad (1.5)$$

DAH_G_{it} and DAH_NG_{it} represent DAH for government and NGOs, respectively. The error term ϵ_{it} is assumed to follow the same structure as ε_{it} in equation (1.4). When a country does not receive any aid (as is the case for 34 percent of country-year observations), both DAH_G_{it} and DAH_NG_{it} are zero, and $DGHE_{it}$ is equal to $TGHE_{it}$. Here we did not transform variables for DAH into logarithms because a zero value for DAH would become a missing value after transformation. We want to keep both donor and aid-receiving countries for equation (1.5). We anticipate that DAH to government is fungible with $DGHE_{it}$, which will give DAH_G_{it} a negative coefficient.

We use the Hausman test to determine whether a fixed- or random-effects model is more appropriate (Hausman 1978). For both equations (1.3) and (1.5), the test strongly rejects the null hypothesis of no correlation between regressors and the disturbances (p-value<0.001); therefore, a fixed-effects model is adopted throughout this study.

3.2. The instrumental variables approach

While the fixed-effects model accounts for unobservable factors, GDP and GGD could still be endogenous. For example, if the government were to increase health spending as part of a stimulus policy, or if the expenditure and debt policies were adopted simultaneously, there would be reverse causality. Moreover, omitted variable bias could arise if factors exist that are correlated with both government health expenditure and GDP. For example, health insurance coverage, which is hard to measure, could bias the coefficient for GDP upwards if health coverage required greater public financial input and were better achieved in higher-income countries. A common solution is to use the ratio of out-of-pocket payment to private health spending to approximate insurance coverage (Smith et al. 2009). However, this proxy could be endogenous, since public

spending on health is likely to affect out-of-pocket payment. Other omitted variables may include health technology assessment and cost-containment mechanisms, which are likely to be more prevalent in advanced economies. The impact of these variables on health expenditure has been well documented, yet data on them are not available at a global level (Gerdtham et al. 1992; Tyson et al. 2012).

To address problems of endogeneity, we extended the fixed-effects model and applied an instrumental variables (IVs) approach. The variable $logGDP_{it}$ is instrumented by the log of trade openness, measured by the per capita sum of imports and exports. For $logGGD_{it}$, we used international liquidity as an IV measured by the number of months of imports that could be financed with a country's reserves. The reasons for choosing these two variables as IVs are discussed in annex A.

Using the proposed IVs, both equations (1.3) and (1.5) are re-estimated by estimating two-stage least squares (2SLS) models with year dummies and country fixed effects. The validity of the chosen IVs is confirmed by a series of tests performed for both models (see Annex A).

Finally, we interacted the sociopolitical variables with country income group dummies to assess the relationship between sociopolitical risk variables and government health expenditure across income groups. Appendix B provides a list of low-, middle-, and high-income countries included in the sample. The regression results show that only interactions between the variable for corruption and income group dummies (high-income countries as the reference) are statistically significant at the 5 percent level; thus, we added only these to the model.

3.3. The 2SLS specification with a focus on health aid

To further evaluate the fungibility of health aid, we confined the sample to recipient countries and modified equation (1.5) in three steps. First, we transformed DAH_G_{it} and DAH_NG_{it} into logarithms to estimate the elasticity of DGHE with respect to DAH. Second, we replaced logs of DAH_G_{it} and DAH_NG_{it} with logs of total DAH in a separate regression. Total DAH is calculated in two steps: (a) by summing DAH_G_{it} and DAH_NG_{it}; and (b) by then adding unspecified DAH (DAH_U) as defined in equation (1.2) to the sum. Third, we interacted variables for aid with sociopolitical variables and

kept only those with coefficients significant at the 5 percent level. We find that the degree of fungibility of health aid varies according to the level of corruption.

Initially, we assumed both logGDP_{it} and logGGD_{it} to be endogenous, as previously discussed; however, the statistical test shows that logGGD_{it} is no longer endogenous. This is probably because *expenditure* policy is less concurrent with financing policy in recipient countries. Consequently, only logGDP_{it} is treated as endogenous and instrumented by trade openness and international liquidity. As before, we tested the IVs and found them valid (see annex A).

All estimation is undertaken using Stata 12. For the fixed-effects regressions, standard errors are adjusted for country clusters. For the 2SLS regressions, calculated standard errors are robust to heteroskedasticity and autoregressive process of order one.

4. SAMPLE AND VARIABLES

The full sample for the fixed-effect model for TGHE includes 120 countries for the years 1995 through 2010, constituting unbalanced panel data of 1,500 observations. The primary data sources used in this study are the following: (a) World Development Indicators (WDI) compiled by the World Bank; (b) the ICRG, produced by the Political Risk Services (PRS) Group; (c) International Monetary Fund (IMF) World Economic Outlook and International Financial Statistics; (d) the WHO National Health Accounts (NHA); and (e) *the Financing Global Health 2012 report* published by the Institute for Health Metrics and Evaluation (IHME). Table 1.1 summarizes model variables before their transformation into logarithms, together with their corresponding data sources. All monetary variables are in per capita terms and are expressed in constant 2005 international dollars.

Table 1.1 Summary Statistics[a] Based on 120 Country Panels

	Mean	Std.	Min.	Max.	Source
Government health expenditure from all sources (TGHE)[a]	697.96	896.02	2.79	4,655.71	WHO
Government health expenditure from domestic sources (DGHE)[a]	695.58	897.53	0.59	4,655.71	WHO IHME
Gross domestic product (GDP)[a]	13.9e+.03	13.7e+03	255.78	74.1e+03	WB
General government gross debt (GGD)[a]	7,249.44	9,268.36	79.91	66.6e+03	IMF
DAH to government[a]	2.39	5.37	0.00	64.83	IHME

DAH to nongovernmental sectors[a]	1.54	4.87	0.00	61.71	IHME
Total DAH, including DAH_U[a,b]	5.20	12.23	0.00	229.83	IHME
Government stability	0.74	0.13	0.28	1.00	PRS
Less corruption	0.49	0.21	0.00	1.00	PRS
Democratic accountability	0.71	0.26	0.00	1.00	PRS
Less ethnic tensions	0.49	0.21	0.00	1.00	PRS
Population age 65 and over (%)	8.27	5.23	0.43	22.69	WB
Ratio of agricultural to nonagricultural output	0.14	0.18	0.00	1.32	WB
Sum of exports and imports[a,c]	14.3e+03	26.2e+03	123.39	23.6e+04	WB
Total reserves in months of imports[c]	4.44	4.26	0.01	40.24	IMF

Source: Authors

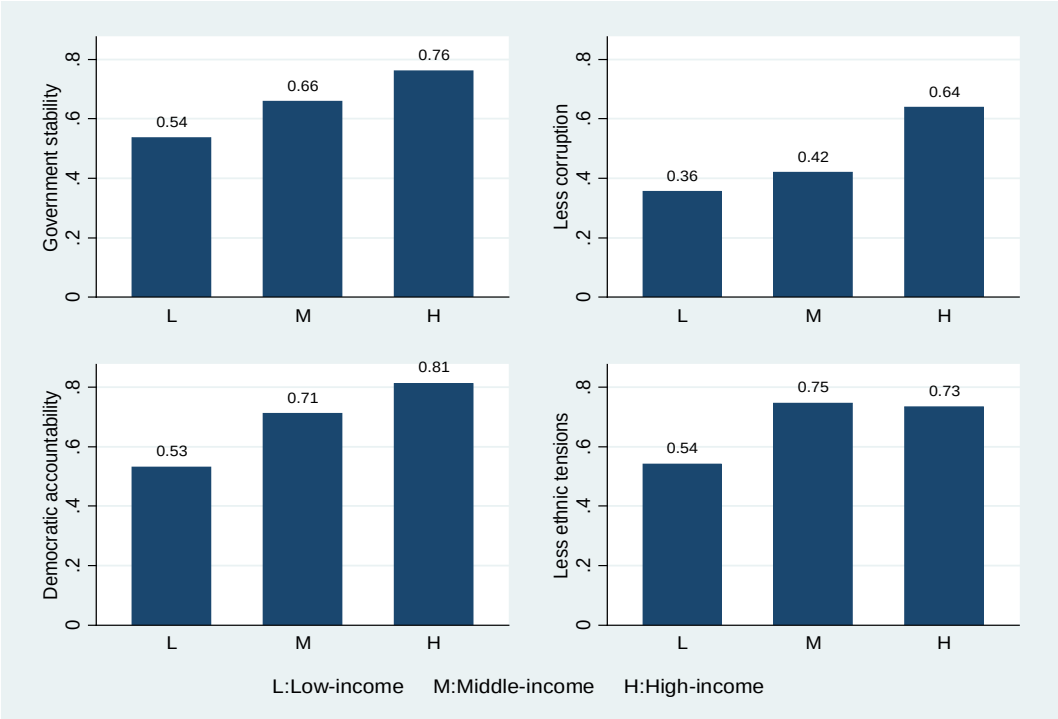
a. All monetary figures in per capita and 2005 international dollars.
b. DAH_U refers to DAH of which delivery channel is unspecified.
c.. These are excluded instrumental variables.

The dependent variable TGHE is obtained from a WHO NHA indicator called general government expenditure on health (GGHE), which includes both domestic and foreign-sourced funds. DGHE is calculated by subtracting DAH channeled to government from TGHE. Data on DAH were provided by IHME. We used DAH for health in preference to official development assistance (ODA) data because the latter excludes contributions of private foundations and NGOs (IHME 2012).

The size of the informal economy is calculated as the ratio of agriculture to nonagricultural output, excluding a nation's total health expenditure from the latter to avoid endogeneity problems. Sociopolitical risk variables are calculated using the ICRG Political Risk Rating data that comprise 12 weighted variables. We selected four of them on the basis of literature review as most likely to be related to government health expenditure. ICRG experts collect political information and make risk assessments using a global standard, assigning points to each variable. See appendix C for a description of the rating system and how we convert the points into comparable risk scores on a scale of 0 to 1. The ICRG defines government stability as the government's ability to stay in power and accomplish its policy goals. Corruption refers to political and financial corruption such as demanding bribes for trade licenses, as well as corruption "in the form of excessive patronage, nepotism, job reservations, "favor-for-favors," secret party funding, and suspiciously close ties between politics and business"(PRS 2012). Democratic accountability is measured by how responsive a government is in terms of five types of governance: alternating democracy, dominated democracy, de facto one-party state, de jure one-party state, and autocracy. Finally, ethnic tensions are measured by the extent to which ethnic and linguistic fragmentation contributes to the tension

within a country (PRS 2012). For this study, countries that have a more stable government, a less corrupt political system, higher democratic accountability, and less ethnic tensions receive higher scores. Country examples are given in appendix C.

Figure 1.1 The Mean Value of Sociopolitical Variables by Income Groups, 120 Countries, 1995–2010



Source: Own computations

We display the mean values of sociopolitical variables for individual income groups in figure 1.1. In general, low-income countries receive the poorest ratings and high-income nations the highest. The largest difference in ratings is detected for corruption, where emerging economies appear to be considerably more corrupt than advanced economies. Ethnic tension is an exception: the average rating was not significantly different at the 5 percent level between middle-income and high-income countries.

For empirical estimation, we included the quadratic term for democratic accountability to capture nonlinearity in government health expenditure. We did not include quadratic terms for other sociopolitical variables because these were not significant at the 5 percent level in any model specifications. In addition, we find that multicollinearity is not a serious issue and discuss this in annex D.

5. RESULTS

5.1 Association between sociopolitical risks and government health expenditure

Table 1.2 presents the results from the TGHE function estimated by the fixed-effects and 2SLS method. Across models I, II and III, per capita GDP and government debt are positively and significantly correlated with TGHE. The elasticity of TGHE with respect to GDP is approximately 0.9 and 0.7 in the fixed-effect and 2SLS models, respectively. Compared with the 2SLS estimator, the fixed-effect estimator seems to overestimate the coefficient on GDP, validating our concern over endogeneity of GDP. Additionally, the 2SLS model suggests that for an average country, an increase in per capita government debt by 1 percent contributes to a 0.27 percent increase in TGHE (p-value<0.01), suggesting that debt financing provides financial leverage to expand public spending on health. The coefficient on the size of the informal sector is negative and large in the 2SLS specifications (p-value<0.01), which fits with our hypothesis that a large informal sector keeps government health spending down.

Table 1.2 Results from Regressions of Government Health Expenditure from All Sources, 1995–2010

Dependent variable	Model I		Model II		Model III	
Log $TGHE_{it}$	Fixed effects		2SLS[c]		2SLS[c]	
	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]
Log per capita GDP	0.94***	(0.10)	0.71***	(0.17)	0.74***	(0.17)
Log per capita gross government debt	0.07**	(0.02)	0.27**	(0.10)	0.27**	(0.10)
Government stability	0.04	(0.10)	0.19*	(0.09)	0.18*	(0.09)
Less corruption	0.15	(0.11)	0.08	(0.08)	-0.20*	(0.09)
× Low-income					0.39*	(0.19)
× Middle-income					0.39**	(0.13)
Democratic accountability	0.92**	(0.30)	0.98***	(0.25)	0.86**	(0.26)
Democratic accountability squared	-0.70**	(0.25)	-0.76***	(0.20)	-0.67**	(0.21)
Less ethnic tensions	-0.05	(0.12)	-0.11	(0.07)	-0.12	(0.07)
Share of agriculture output	-0.89	(0.51)	-0.76**	(0.24)	-0.75**	(0.24)
Log share of population age 65 & over	0.34*	(0.16)	0.15	(0.16)	0.14	(0.16)
Number of observations	*1,500*		*1389*		*1,389*	
Number of countries	*120*		*116*		*116*	
R^2	*0.62*[b]		*0.62*		*0.63*	

Source: Authors

a. The standard errors (denoted by S.E.) are robust to heteroskedasticity and autocorrelation.

b. This is the within $R2$. Overall $R2$ is 0.92.

c. Fixed effects and year dummies are included in the 2SLS models.

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

Among all the sociopolitical variables included, democratic accountability is the most important in explaining variation in TGHE. The square of accountability is negative and significant, suggesting that the positive association between accountability and TGHE weakens when accountability continues to increase. In addition, the 2SLS models show that, on average, countries with greater government stability (p-value<0.05) have higher TGHE. Interaction terms indicate that in low- and middle-income countries, less corrupt governments spend more on health (p-value<0.05); whereas in high-income countries, a higher degree of corruption is associated with higher TGHE (p-value<0.05).

The results for the DGHE function are given in table 1.3. In general, the conclusions are identical to those in the TGHE specifications. For international aid, we find evidence of the fungibility of DAH to government in the 2SLS models. Here, one (international) dollar increase in aid is estimated to relate to a decrease in DGHE by 1 percent (p-value<0.01). In contrast, DAH to NGOs is found to be related to an increase in DGHE (p-value<0.05).

Table 1.3 Results from Regressions of Domestically Financed Government Health Expenditure, 1995–2010

Dependent variable		Model IV	Model V		Model VI	
Log $DGHE_{it}$		Fixed effects	2SLS[c]		2SLS[c]	
	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]
Log per capita GDP	0.94***	(0.13)	0.66***	(0.18)	0.72***	(0.17)
Log per capita gross government debt	0.06*	(0.03)	0.28**	(0.10)	0.26**	(0.10)
Per capita DAH to government	-0.01	(0.00)	-0.01**	(0.00)	-0.01**	(0.00)
Per capita DAH to NGOs	0.00	(0.00)	0.01*	(0.00)	0.01*	(0.00)
Government stability	0.12	(0.10)	0.21*	(0.09)	0.02*	(0.09)
Less corruption	0.19	(0.14)	0.09	(0.09)	-0.26*	(0.12)
× Low-income					0.67**	(0.23)
× Middle-income					0.40**	(0.15)
Democratic accountability	0.86**	(0.28)	0.93***	(0.26)	0.75**	(0.28)
Democratic accountability squared	-0.63**	(0.22)	-0.74***	(0.21)	-0.60**	(0.22)
Less ethnic tensions	-0.07	(0.11)	-0.05	(0.08)	-0.07	(0.08)
Share of agriculture output	-0.48	(0.36)	-0.78**	(0.27)	-0.77**	(0.27)
Log share of population age 65 & over	0.54*	(0.23)	0.37*	(0.18)	0.35*	(0.18)
Number of observations	*1,494*		*1385*		*1,385*	
Number of countries	*120*		*115*		*115*	
R^2	*0.54*[b]		*0.54*		*0.63*	

Source: Authors

a. The standard errors (denoted by S.E.) are robust to heteroskedasticity and autocorrelation.

b. This is the within $R2$. Overall $R2$ is 0.92.

c. Fixed effects and year dummies are included in the 2SLS models.

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

5.2 International aid and government health expenditure from domestic sources

Table 1.4 presents the results of the model for DGHE applied to countries receiving health aid. The variables for government stability, democratic accountability, the size of the informal sector, and the share of population age 65 and over are statistically significant in both specifications.

Table 1.4 Results from Regressions of Domestically Financed Government Health Expenditure with Interactions between Sociopolitical Variables and Aid, 1995–2010

Dependent variable Log $DGHE_{it}$	Model VII 2SLS[c]		Model VIII 2SLS[c]	
	Coeff.	S.E.[a]	Coeff.	S.E.[a]
Log per capita GDP	0.92***	(0.22)	0.76***	(0.20)
Log per capita government gross debt	0.07	(0.04)	0.03	(0.03)
Government stability	0.38***	(0.11)	0.30***	(0.09)
Less corruption	0.26*	(0.11)	-0.05	(0.11)
Democratic accountability	0.87**	(0.27)	0.68*	(0.29)
Democratic accountability squared	-0.70**	(0.22)	-0.60**	(0.22)
Less ethnic tensions	0.08	(0.10)	-0.02	(0.09)
Log per capita DAH to government	-0.14**	(0.04)		
× Less corruption	0.13**	(0.04)		
× Less ethnic tensions	0.11*	(0.05)		
Log per capita DAH to NGOs	0.00	(0.01)		
Log per capita total DAH including DAH_U			-0.07**	(0.03)
× Less corruption			0.13*	(0.06)
Share of agriculture output	-0.79**	(0.25)	-0.77**	(0.25)
Log share of population age 65 and over	1.03**	(0.29)	0.74**	(0.28)
Number of observations	*707*		*828*	
Number of countries[b]	*70*		*77*	
R^2	*0.56*		*0.59*	

Source: Authors

a. The standard errors (denoted by S.E.) are robust to heteroskedasticity and autocorrelation.

b. Sample is limited to aid-recipient countries.

c. Fixed effects and year dummies are included in the 2SLS models.

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

From model VII we find that DAH to government is fungible with government health expenditure from domestic sources (p-value<0.01), and the degree of fungibility is lower in countries with lower risks of corruption (p-value<0.01) and ethnic tensions (p-value<0.05). Interaction terms show that for an average country included in model VII, a 1 percent increase in DAH to government is associated with a 0.02 percent decrease in DGHE. (The result is calculated as 0.02 percent=-0.14+0.13×0.38+0.11×0.65, where 0.38 is the mean score for less corruption and 0.65 is the mean score for less ethnic tensions for 70 countries included in model VII.) However, we do not find evidence of connections between DAH to NGOs with DGHE. This result differs from the finding derived from the 2SLS models in table 1.3.

Using the same approach to calculating fungibility of total DAH, and given the mean score for less corruption of 0.39 for model VIII, we find that a 1 percent increase in total DAH is related to a 0.02 percent decrease in DGHE. Similar to model VII, model VIII shows that total DAH is more fungible in countries where corruption is more prevalent.

6. DISCUSSION

Overall, the results support our hypothesis that aggregate income and a government's fiscal capacity explain much of between-country variation in government health spending. The size of the informal sector is highly significant across all specifications; reflecting the size of the tax base from which the government raises revenue and collects social health insurance premiums, it is a determinant of the level of public spending on health. For emerging economies, this implies that a large informal sector limits the government's ability to mobilize health funds.

After controlling for other variables, variations in levels of government health expenditure are attributed to country-specific governance variables and health aid, which are discussed individually as follows.

6.1 Democratic accountability

All models reveal that democratic accountability exhibits a diminishing positive correlation (that is, an inverse U-shape) with government health expenditure. These findings counter previous literature reporting democracy as having a linear relationship with public sector health spending. The diminishing positive correlation may explain why

there is mixed evidence on the direction of correlation between democracy and social spending. In this study, the turning point beyond which democracy is negatively correlated with per capita government health expenditure is between an ICRG rating of 0.6 and 0.7, for example, 0.92/(2*0.7) for model I in table 1.2 (and similarly for other models), which is categorized as moderate democracy. This means that a government with an alternating democracy or autocracy (the lowest and highest levels of political risk associated with accountability) spend less on health.

The negative correlation between democratic accountability and government health expenditure beyond the turning point, at a high level of democracy, may possibly be explained by the separation of power and checks and balances in democratic systems, which may limit the levels of public spending on health. As defined by the ICRG, an alternating democracy has an active opposition party and an executive body controlled by a political party, which serves no more than two successive terms (PRS 2012). In this system, short-lived administrations may not be willing to make commitments to financial input into health programs that are less visible or that last longer than their terms.

Autocratic governments are the least responsive type. The leadership of an autocracy is not subject to an election in which political opponents are allowed to stand (PRS 2012). In this context, autocratic governments may place little emphasis on social welfare and population health, and the level of government health expenditure may be lower in these countries as a result.

6.2 Government stability

The finding that a stable government spends more on health is reflective of the benevolent behavior of incumbent governments and the increase in spending realized through compromise. When a regime is able to maintain power, it may have less incentive to seek rents if it does not need to worry about opposition rent-seeking. This is in line with the social welfare–maximizing model of government behavior, where officials seek office to advance policies designed for the social good (Pearce 1992). Analyses previous to ours in 18 OECD countries also find significant improvements in short-run political performance to occur with greater government stability (Huber 1998). Our sample includes developing countries, so higher government health expenditure may also be interpreted as a form of better political performance of a stable government in emerging economies.

Our results counter some previous work reporting stability to be negatively correlated with health expenditure (Vatter and Rüefli 2003). Our findings are not unexpected given that we use a long time period and look at a large cross-section of countries. Furthermore, given that we control for democratic accountability, the estimated relationship between government stability and health expenditure is conditional on the degree of democracy. Interpretation of the results in this study differs from that of other studies that do not consider variation in polities.

6.3 Corruption

Our models suggest that corruption in developing countries is associated with lower spending on health; whereas corruption in high-income nations is linked to higher government health expenditure. This finding differs from previous findings where corruption is universally negatively correlated with public sector health spending. Overall, the empirical evidence to support this finding is limited.

One reason for our finding may be that as a country becomes richer and government expenditure increases, there may be a diffusion of corruption-related rent-seeking from capital sectors offering greater opportunities for kickbacks (for example, military and energy) to areas that traditionally have lower rewards (for example, health and education). While Mauro (1998) finds that there is a small effect of corruption on reducing health expenditure, he hypothesizes that health spending on state-of-the-art medical technology and sophisticated hospital systems may lead to a higher susceptibility to rent-seeking. Mauro (1998) does not include a subsample analysis by country income group for the effect of corruption on health expenditure. In addition, in a corrupt high-income country, the amount of the marginal product of health expenditures may be relatively low, either because the actual volume of health care is low or because care is inappropriate. In this context, more public resources are required by high-income corrupt governments to achieve a given health outcome. It may also reflect the inability to develop a political consensus on how to contain costs, which is captured by the variable for corruption.

6.4 International aid

We find that the substitution of DAH to government for domestically financed government health spending is greater in countries where corruption is prevalent. This result persists when DAH to government is replaced by total DAH. Farag et al. (2009)

estimate that a 1 percent increase in donor funding for health is associated with a 0.14 percent decrease in government health spending in low-income countries and a 0.04 percent decrease in middle-income countries. For this study, model VIII estimates that the elasticity of DGHE with respect to total DAH to be -0.025 percent for an average low-income country (awarded a mean score of 0.35 for "less corruption"), and to be -0.015 percent for an average middle-income country (with a mean score of 0.42 for "less corruption"). Farag et al. (2009) conclude that a higher degree of fungiblity in low-income countries could be due to a higher share of donor funding within government health spending. Our findings show further that this relationship is likely also to be due to a higher degree of corruption in low-income countries.

We find mixed evidence on the linkage between DGHE and DAH to the nongovernmental sector: these are either complementary or have no connection. This result is different from that of Lu et al. (2010), who report that DAH to NGOs is related to increases in government health expenditure from domestic sources. This discrepancy could be due to different samples, functional forms, and estimation methods applied in the two studies. Another key finding of our study is that the degree of fungibility of DAH to government increases with the degree of ethnic tensions. Further investigation is needed to explore this issue.

Note that we conducted robustness checks (see appendix E) and found that the results for sociopolitical variables and health aid are consistent across various model specifications. An exception is that when we excluded the variable for democratic accountability, the coefficient for government stability became insignificant. More work is required to examine this relationship between democratic accountability and government stability and their interaction effect on government health expenditure.

7. POLICY IMPLICATIONS AND CONCLUSION

Our work highlights that for emerging economies, corruption is an important determinant of health expenditure. Reforms that aim to eliminate corruption are fundamental to improving the capacities of developing countries to scale up health resources. A recent IMF report (2012) emphasizes that corruption in government increases the incentives of firms to operate in the informal economy. Hence, tackling corruption may lead to a reduction in the size of the informal sector, thus increasing tax revenue for domestic health expenditure in poor countries.

The positive relationship between corruption and government health expenditure in advanced economies underlines the importance of tackling corruption as part of a cost containment agenda. Corruption could reflect impact of health sector lobby groups, poor incentive structures, inability to work across competing political interests, or challenges in strategic purchasing. Studies have shown that fraud and corruption are among the leading causes of inefficiency in health care systems (for example, Gee et al. 2011), and governments of developed countries have employed initiatives such as the 2005 European Healthcare Fraud and Corruption Network and the 2010 United States Improper Payment Elimination and Recovery Act to address such issues. Such initiatives could serve as models for developing countries, but innovative solutions should also be sought.

Our finding that DAH to government is likely to be more fungible in corrupt countries suggests that corruption will have more negative impacts in countries where foreign aid makes up a larger proportion of public sector health spending. Moreover, the disproportionate decrease in domestically funded government health expenditure associated with health aid to corrupt governments raises the question of whether foreign aid per se reinforces corruption. A large body of literature suggests that corrupt governments use aid less effectively (Burnside and Dollar 2000; Masud and Yontcheva 2005). For these reasons, donors might consider imposing strong monitoring mechanisms for more corrupt countries. Donors might also proactively make aid conditional on recipient governments committing to anticorruption reforms, securing domestic health funds, and achieving preset performance targets. Such approaches have been adopted by the Global Alliance for Vaccines and Immunizations and the Global Fund to Fight AIDS, Tuberculosis and Malaria (WHO 2001).

The level of ethnic tension in aid-receiving countries deserves attention since it is correlated with greater fungibility of DAH to government. Delivering aid through the nongovernmental sector may be an option in countries with high ethnic tension; however, the feasibility of this kind of approach depends on institutional arrangements and the capacities of NGOs in individual countries. In cases where health aid is targeted for specific ethnic groups, we recommend that donors track government health expenditure to ensure that the recipient governments do not reduce domestic resources that finance care for marginalized groups.

Finally, several limitations of this study need to be acknowledged. The variables for sociopolitical risks that we have used may be potentially biased as these are based on subjective judgments of ICRG experts. Future efforts to validate our conclusions should consider using the World Bank's Country Policy and Institutional Assessment (CPIA) database, which includes variables for periods since 2005 for transparency, accountability, and corruption. Future work should also consider obtaining more and higher-quality data for country sociopolitical factors for exploring subnational analyses. In addition, current tracking of DAH is based on imperfect primary data, aggregated across many sources. Further work might also develop more sophisticated models, able to relax some of the assumptions necessary in our estimation methods.

In conclusion, we have identified the roles of various sociopolitical factors and international aid in explaining between-country variation in government health expenditure. Our results add to existing evidence on the relationship between fiscal capacity and government health expenditure, and provide new insights about sociopolitical variables. We have also provided additional evidence related to international aid, including the fungibility of aid for health and its relationship to the degree of corruption and ethnic tensions in recipient countries.

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Annex A The Assumptions and Tests for Instrumental Variables (IVs)

This study uses trade openness and international liquidity as an IV for per capita log GDP and government gross debt, respectively. Trade openness has been found in the literature as a consistent driver of GDP growth and thus is correlated with the log of per capita GDP (Baldacci et al. 2007). The assumption here is that transactions between an economy and the rest of the world are unlikely to affect government health expenditure directly, other than through their impact on GDP. Conceptually, this instrument may be valid for looking at health spending because health care exhibits economic characteristics of low portability and labor intensiveness, and plays a limited role in international business. As evidence of the last quality, in the OECD countries the level of trade in health care accounts for less than 1 percent of total health expenditure in the public and private sector (OECD 2011).

International liquidity is potentially a good instrument for government debt because external public debt is serviced by international reserves (Rowland and Torres 2004). In this context, the variable for international liquidity is related to government debt, and we conjecture that international liquidity is not correlated with government health expenditure except through debt financing.

For each 2SLS specification, the Kleibergen-Paap (K-P) (2006) underidentification test strongly rejects the null hypothesis that the model is not identified (p-value<0.01). The weak identification test generates a large robust K-P rk Wald F statistic, showing that the instruments are strong, with the size distortion smaller than the 10 percent for the 5 percent level test. Moreover, the F-test on excluded IVs produces a p-value of nearly zero; thus the IVs are jointly significant in all functions.

For specific models, the endogeneity test of logGDP_{it} and logGGD_{it} in models II, III, V, and VI (tables 1.2 and 1.3) rejects the null hypothesis that the endogenous regressors can be treated as exogenous at the 5 percent level. This confirms our hypothesis that GDP and government debt are endogenous. Similarly, the endogeneity test of logGDP_{it} in models VII and VIII shows logGDP_{it} is not exogenous. The excluded IVs for logGDP_{it} in models VII and VIII are verified using the Sargan-Hansen test (Hansen et al. 1996) of overidentifying restrictions. The null hypothesis is that the excluded IVs are not correlated with the error term and are rightly excluded from the main equation. The result cannot reject the null hypothesis (p-value>0.1); thus the proposed IVs are valid.

Annex B Country Classification by Income Levels

Using the World Bank classification, we classify a country as low-income if its per capita gross national income (GNI) was US$765 or less in 1995, as middle-income if it was between US$766 and US$9,385, and as high-income if it was more than US$9,385. The 1995 criterion is used because 1995 is the first year of the study period. Table B.1 presents countries included in the sample.

Table B.1 120 Sample Countries by Income Groups

Low-income countries	Brazil	Syrian Arab Republic
Armenia	Bulgaria	Thailand
Azerbaijan	Chile	Trinidad and Tobago
Burkina Faso	Colombia	Tunisia
Cameroon	Costa Rica	Turkey
China	Croatia	Uruguay
Congo, Dem. Rep.	Dominican Republic	Venezuela, RB
Congo, Rep.	Ecuador	***High-income countries***
Cote d'Ivoire	Egypt, Arab Rep.	Angola
Ethiopia	El Salvador	Australia
Gambia, The	Gabon	Austria
Ghana	Guatemala	Bahamas, The
Guinea	Guyana	Bahrain
Guinea-Bissau	Honduras	Belgium
India	Hungary	Canada
Indonesia	Iran, Islamic Rep.	Cyprus
Kenya	Jamaica	Denmark
Madagascar	Jordan	Finland
Malawi	Kazakhstan	France
Mali	Libya	Germany
Moldova	Latvia	Iceland
Mozambique	Lebanon	Ireland
Nicaragua	Lithuania	Italy
Niger	Malaysia	Japan
Pakistan	Malta	Korea, Rep.
Senegal	Mexico	Kuwait
Sudan	Morocco	Luxembourg
Tanzania	Namibia	Netherlands
Togo	Nigeria	New Zealand
Uganda	Oman	Norway
Ukraine	Panama	Portugal
Vietnam	Paraguay	Saudi Arabia

Yemen, Rep.	Peru	Serbia
Zambia	Philippines	Sierra Leone
Middle-income countries	Poland	Singapore
Albania	Romania	Spain
Algeria	Russian Federation	Sweden
Argentina	Slovak Republic	Switzerland
Belarus	Slovenia	United Arab Emirates
Bolivia	South Africa	United Kingdom
Botswana	Suriname	United States

Source: Authors

Annex C Calculations of Variables for Sociopolitical Risks

The ICRG Political Risk Rating system comprises twelve risk variables (termed "components" by ICRG); the present study uses four of these. Using a global standard for country risk assessment, ICRG experts assign points to each component monthly or annually. Points range from zero to a maximum numerical value that depends on the component's weighting in the overall risk of a country (PRS 2012). The maximum points for all 12 components total 100, and lower points in a given component indicate that the country exhibits higher risks. The maximum number of points that can be assigned to "government stability" is 12, while the maximum for "democratic accountability," "corruption," and "ethnic tensions" is 6. Several components are further divided into subcomponents; in these cases, ICRG experts will first assign points to each subcomponent and then sum up the points to generate the final point total for that component. ICRG's principles for assigning points are described in column 3 of table C.1. For more on ICRG methodology please refer to their website, accessed at http://www.prsgroup.com/ICRG_Methodology.aspx.

Our analysis used ICRG points data for each of the sociopolitical variables. To make the selected components comparable, we converted the average annual points to a scale of 0 to 1 (hereafter referred to as scores) for each component. For example, if a country was awarded 10 points for government stability, its score would be 0.83 (=10/12). This removes the weights assigned by ICRG and gives a standardized annual country risk rating for each sociopolitical variable.

Table C.1 Description of Sociopolitical Variables and Country Examples for Year 2010

Variable name	Max. points	Basic principle of assigning points	Examples: country score
Government stability	12	Subcomponents (max. points) - Government unity (4) - Legislative strength (4) - Popular support (4)	Singapore: 0.92 China: 0.85 United States: 0.69 United Kingdom: 0.64
Less corruption	6	N/A. A zero score is given to countries where corruption led to a fall of government or reorganization of political/law systems	United States: 0.67 United Kingdom:0.67 Brazil: 0.50 India: 0.42 China: 0.33
Democratic	6	Points are awarded on the basis of	United States: 1.00

accountability		five types of governance: alternating democracy (6 points), dominated democracy, de facto one-party state, de jure one-party state, and autocracy (0 point).	United Kingdom: 1.00 South Africa: 0.83 Russian Federation: 0.42 China: 0.25
Less ethnic tensions	6	Lower/higher points are given when there are high/low racial tensions.	United Kingdom: 0.78 China: 0.77 Pakistan: 0.49

Source: Authors

Annex D Examining Multicollinearity among the Independent Variables

Table D.1 presents the correlation matrix of sociopolitical variables based on the full sample. We found that the highest correlation is between corruption and democratic accountability (0.52). We tackled this issue in sensitivity analysis, appendix E.

Table D.1 Correlation Matrix of Sociopolitical Variables, 120 Countries, 1995–2010

	Government stability	Less corruption	Democratic accountability	Less ethnic tensions
Government stability	1.00			
Less corruption	0.09	1.00		
Democratic accountability	-0.25	0.52	1.00	
Less ethnic tensions	0.09	0.32	0.20	1.00

Source: Authors

To further investigate the issue of multicollinearity among sociopolitical variables, we estimate variance inflation factors (VIF) for all regressors. A general rule is that there is evidence of multicollinearity if the largest VIF is greater than 10 or if the mean VIF is considerably larger than unity (Chatterjee and Hadi 2006). The results from the basic model suggest that the largest VIF (6.56) is observed for the log GDP per capita and the overall mean VIF of 3.07. The VIFs for sociopolitical risk variables range between 1.37 and 2.22, which are considerably below 10.

Annex E Sensitivity Analysis

The sensitivity analysis assesses whether any of the findings in this study are robust to different specifications. In particular, our primary models show that corruption is associated with higher government health spending in high-income countries, a finding that could potentially be controversial and thus requires further investigation. To validate this finding, we first exclude the variable for democratic accountability and its quadratic term. This is necessary as the pairwise correlation between "democratic accountability" and "less corruption" is the highest (0.52, see table D.1) among all pairs of sociopolitical variables. Excluding "democratic accountability" would reduce multicollinearity. Second, we account for outliers by excluding countries where per capita government health expenditure from all sources (TGHE) fell in the top 5 percent (Austria, Denmark, Germany, Luxembourg, Norway, and United States) and bottom 5 percent (Democratic Republic of Congo, Ethiopia, Guinea, Niger, Pakistan, and Sierra Leone) of the sample average over the study periods. This reduced the full sample size from 120 to 108 countries.

The above two strategies were applied to models III and VI, respectively, and new coefficient estimates for sociopolitical covariates are presented in table E1. Models III.A and VI.A exclude variables for democratic accountability; models III.B and VI.B exclude both outliers and variables for democratic accountability. We find that the coefficient on "less corruption" is negative and significant at the 5 percent level across alternative specifications, which is consistent with the results derived from the primary models. As a side result to this exercise, we found that the coefficient on "government stability" became insignificant at the 5 percent level for models III.A, III.B, and VI.B.

We also wished to further investigate the finding from the primary models that DAH to NGOs could be either complementary or have no connection with DGHE. We conjecture that this inconsistency is due to different measures for DAH. For sensitivity analysis, we assume that DAH to unknown recipients went to governmental sectors, and rerun model VII (renamed as model VII.A here). We replaced the original variable for DAH to government (DAH_G) with a new variable termed DAH_GU, calculated as DAH_G+DAH_U (see equation [1.2] for notations). In this case, domestically financed government health expenditure was recalculated using the formula, DGHE=TGHE-DAH_GU. We called this new dependent variable $DGHEre_{it}$ and used its logarithm form ($\log DGHEre_{it}$) as a new dependent variable. Moreover, we assumed that all unspecified

DAH went to nongovernmental bodies. In this case, we added DAH_U to DAH_NG and generated a new variable for DAH to NGOs. We then re-estimated model VII and denoted it as model VII.B. Unlike the results in the first case, the calculation of the dependent variable remains unchanged.

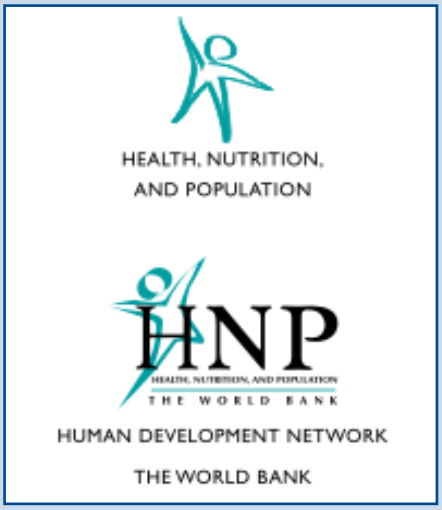
The new regression results are given in table E.1. In general, the sign of the coefficients on variables for DAH are consistent with the original models. Coefficients on DAH to government remain significant, while the one on DAH to NGOs is still insignificant at the 5 percent level. We adopted the same strategy to re-estimate model V in which DAH is measured in levels rather than in logarithms. We obtained the same result as the primary model, namely, DAH to NGOs complements DGHE. Therefore, our conclusion is that mixed evidence does indeed exist on the relationship between DGHE and DAH to NGOs.

Table E.1. Coefficient Estimates for Sociopolitical Variables and Development Assistance for Health (DAH) from Alternative Specifications

	Model III.A		**Model III.B**		**Model VI.A**		**Model VI.B**		**Model VII.A**		**Model VII.B**	
Dependent variable	Log $TGHE_{it}$		Log $TGHE_{it}$		Log $DGHE_{it}$		Log $DGHE_{it}$		Log $DGHEre_{it}$		Log $DGHE_{it}$	
Selected key covariates	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]	Coeff.	S.E.[a]
Government stability	0.15	(0.09)	0.17	(0.09)	0.19*	(0.09)	0.19	(0.10)	0.45***	(0.12)	0.38***	(0.11)
Less corruption	-0.25*	(0.11)	-0.27**	(0.09)	-0.33**	(0.11)	-0.27*	(0.13)	0.03	(0.12)	0.09	(0.12)
× Low-income	0.50*	(0.19)	0.52**	(0.18)	0.79**	(0.21)	0.66**	(0.23)				
× Middle-income	0.45***	(0.14)	0.46**	(0.13)	0.47**	(0.14)	0.45**	(0.15)				
Democratic accountability									0.67*	(0.33)	0.77**	(0.29)
Democratic accountability squared									-0.62*	(0.26)	-0.63**	(0.23)
Less ethnic tensions	-0.16	(0.09)	-0.12	(0.07)	-0.07	(0.08)	-0.13	(0.10)	-0.15	(0.11)	0.03	(0.10)
Log per capita DAH to government, including DAH_U									-0.21***	(0.06)		
× Less corruption									0.16**	(0.06)		
× Less ethnic tensions									0.14*	(0.07)		
Log per capita DAH to NGOs									0.01	(0.01)		
Log per capita DAH to government											-0.15**	(0.04)
× Less corruption											0.16***	(0.05)
× Less ethnic tensions											0.10*	(0.04)
Log per capita DAH to NGOs, including DAH_U											0.00	(0.01)
Number of observations	*1248*		*1389*		*1385*		*1244*		*683*		*705*	
Number of countries	*105*		*116*		*115*		*104*		*70*		*64*	
R^2	*0.65*		*0.65*		*0.57*		*0.57*		*0.59*		*0.58*	

Source: Authors

a. The standard errors (denoted by S.E.) are robust to heteroskedasticity and autoregressive process of order one.



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