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PUBLIC SPENDING ON HEALTH CARE AND HEALTH OUTCOMES: CROSS-COUNTRY COMPARISON

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KEYWORDS

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ABSTRACT

This study aims to analyze the effect of government spending on health-care on health outcomes with cross-national comparison. We run cross-sectional regressions to estimate the strength of association between child and infant mortality rate and public health expenditures in worldwide sample. We find statistically significant and robust results by various specifications. We found government health spending as a share of GDP is negatively associated with lower level of under-5 mortality by elasticities of from -0.17 to -0.22. The elasticity is -0.20 for infant mortality. When government spending as a share total health expenditures is used as estimator, elasticities are -0.33 for under-5 mortality and -0.23 and -.0.32 for infant mortality. We also found significant and negative coefficient a number of socio-political determinants such as the law and order, education level, population as well as income level as a main determinant. Compared to previous studies, we found the income level to be slightly less significant and the public health spending to be slightly more significant empirically.

1. INTRODUCTION

As apart from other markets in part, health care services have some unique characteristics such as prevalence of uncertainty and risk, the problem of asymmetric information, restricted competition and widespread externalities. Health care is also one of the largest industries in the global economy, so that health spending as share of GDP is approximately %6.83 on average (see Table 1). Government intervention to health sector is also common fact in the worldwide. Government share in health expenditure is 58.2% on average in the world (see Table 1). Governments not only spend money on health but also they use different intervention forms such as regulations and public provisions to intervene health care system of the country. Thus, the government hasinfluence on health sector by altering the of amount public money on health care or changing its social welfare system or regulating private health sector.Governments' role is also important to reform of health care systems because governments can alter their health care systems through altering amount of public funding. Governments in developing countries actively attempt to improve the social welfare of their citizens via to change in composition and direction of public expenditure. Health spending also has high potential of capacity to transfer and to redistribute income toward the poor, since the poor heavily consume public goods and services. Therefore, it can be considered that total public role on health is considerably substantial in the modern societies.

While health care is financed by a multiple sources in most countries, there is a fair amount of variation in the degree of public financing of health care across countries and over time. However, governments' role in the health market is considerably large in especially developed countries. Studies show that public health spending has powerful impact not only on components of health services that use by the poor but also on vital indicators such as infant mortality, access to safe water or sanitation in low income countries. Nevertheless, countries with low income has low amount of public spending on health care, although public spending which aimed at improving the health status is expected to leads to a better quality of life as well as positively influences economic development of a country.

The study aims at analyzing the government's role and government spending on health care by cross country comparison to understand how changes public spending among countries and how does public spending have effect on health outcomes. Section 2 discusses governments' role in health care and Section 3 and Section 4 analyze the level of public spending and health outcomes with cross-national data. Finally, Section 5 use regression analysis to estimate the associations between health outcomes and government health spending together with other socio-economic predictors.

2. GOVERNMENT INTERVENTION IN THE HEALTH CARE SECTOR

Government intervention in health care market has been justified in three main grounds; assuring the optimal production of public goods, offsetting market failures such as externalities, and subsidizing poor people who cannot finance out-of-pocket or buy private insurance (Musgrove, 1996; Self and Grabowski, 2003). Governments employ several instruments to intervene health markets; they can stimulate information distribution; take regulative activities; finance private health services with public funds and, supply health services itself through public facilities and staffs (Musgrove 1996). However a general and simple pattern on governments' role and their instruments in the health markets cannot be drawn from country practices. There is no a simple and valid prescription for all countries on whether governments intervene and how they do it. Nevertheless, some important points could be determined for decisions for whether governments intervene or not and which instruments they use. Musgrove (1999) determines the nine criteria based on economic efficiency (public goods, externalities, catastrophic costs and cost-efficiency), ethical reasons (poverty, vertical equity, horizontal equityand rule of rescue) and political considerations (public demands) related with government intervention to health sector.

Interventions based on the reason of economic efficiency are especially important to treat communicable diseases that create positive externalities when they have been cured, to ensure safety for food or water, and to correct insurance market failures. There are extremely important health-related activities which must be financed by the government to obtain socially optimum level of consumption for all countries. In these kinds of conditions, public provided health care is probably more efficient than private sector. At the same time, these types of health services are expected to have considerably important impacts on health outcomes such as life expectancy, infant or child mortality, although comprehension of services and its volume are related to income level of both people and country. Aside to improve income distribution through public funded health services, public health expenditures are matter more to the poor than the non-poor or to the low income countries than the high income countries to obtain vital health outcomes.

Empirical studies find that the poor are more strongly affected by public health expenditure in comparison with the non-poor, while the non-poor are more likely to obtain medical care when they are sick (Bidani and Ravallion, 1997; Castrol-Leal et al., 1999; Gwatkin, 2000; Wagstaff and Watanbe, 2000, Makinen et al., 2000). In a sample of Indonesian households, Deolalikar (1995)

finds that the marginal impact of public health spending on the incidence and duration of children's illness is slightly larger among the poor than the non-poor, from the data on Indonesia. Gakidou and King (2000) find that GDP per capita, health expenditure per capita, and the percent of the population earning less than one international dollar per day are all negatively correlated with health inequality. Furthermore, the relationship between health inequality and expenditure on health is strong at lower levels of income.Amaghionyeodiwe (2009) found from the study on Nigeria that income level of people is matter in health status and the poor are more strongly affected by public spending on health care relative to the non-poor. Public health spending has a consistent and significant influence on child mortality among the poor. Gupta et al. (2003) found the results that supporting the fact that the poor are more strongly affected by public spending on health care in comparison with the non-poor. The poor heavily rely on public health facilities and services compared to the rich. As a result, public health spending has obvious impact on health status of the poor.

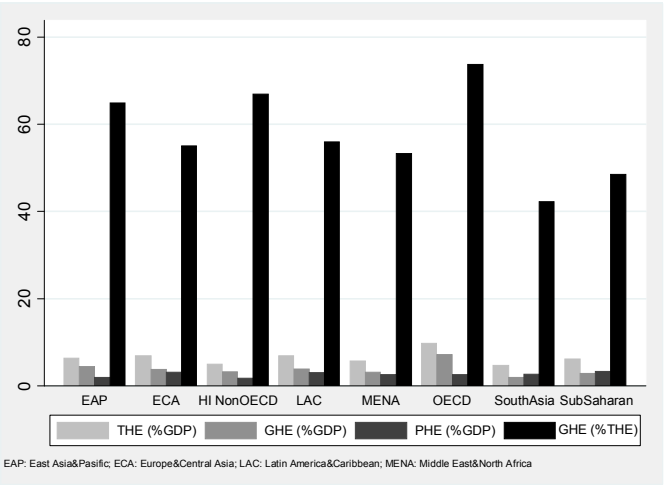
Therefore, not only amount of public health spending but also its composition is a matter. Public spending on essential health services such as immunization, communicable diseases, preventive health services, and food safety is justified by disease reduction. As these components of health care services have high level of externalities rather than curative services, a minimum package of these services provided by the government would reduce mortality rates (Gupta et al., 2002).

3. HEALTH FINANCING AND PUBLIC SPENDING ON HEALTH CARE

Alternative resources of financing for health-care expenditure are mainly public funds, mandated social insurance systems, private insurance systems and out-of-pocket payments. The first two of them are related to government intervention on health sector, while the last two of resources can be classified private health expenditures. In general, health care spending varies considerably by the country. The differences may be attributed to a variety of factors including income level, accepted role of government, demographic characteristics, incidence of illness, access to and type of insurance, market forces and practice patterns.

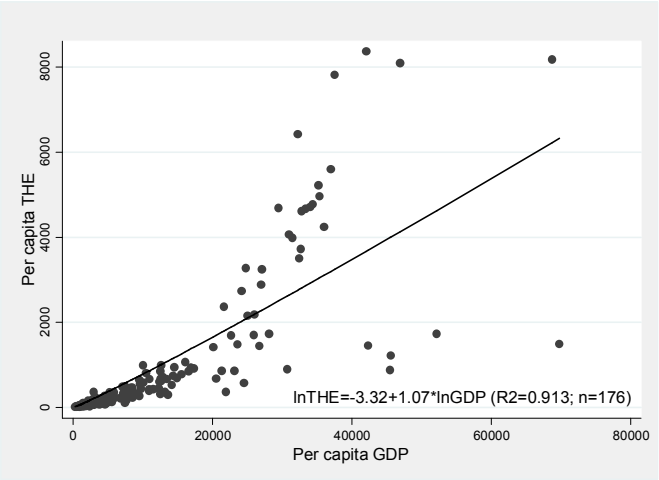
Graph 1 indicates private and government health-care spending with alternative classifications according to various regions. As can be seen from Graph 1, total health expenditures (THE) as share of GDP and government health expenditures (GHE) as share of total health expenditures are relatively low in the low income countries such as Sub-Saharan countries and South Asia Countries, compared to high-income countries such as OECD and high income non-OECD countries. As a share of GDP, health spending in the OECD region is 8.2 percent while in the Sub-Saharan countries which have the lowest level of health spending, it is 2.9 percent. These ratios considerably vary between countries within each region. Government share of total health spending in OECD and Sub-Saharan countries are respectively 64.9% and 45.3% and Sub-Saharan region has the lowest level of government health spending with below the world average (62.8 percent). The graph shows that in general, countries lower per capita income have considerably higher proportion of private expenditures and lower of total health spending for both per capita and as share of GDP. It can be assumed that health care spending rise as income rises, which suggests health-care as a *superior* or *luxury* good (Musgrove, 1996).

Graph 1. Health Expenditures Around the World



Graph 2 shows relationship and fitted values between per capita health expenditure and per capita GDP (PPP, international dollars) from a log-log regression. Variance of per capita health expenditures cross-country can be explained by per capita income of countries. As regression coefficients can be interpreted as elasticity in a log-log regression, we can say that income elasticity of health expenditures is larger from one in analysis of Graph 2. But it should be taken into consideration that this relationship may be a result of human capital which rises by health expenditures or it may be caused by demand triggered by raising income. In any case, this relationship between health expenditure and per capita GDP is not surprising. A numerous studies have found that income per capita explains most of the variance in health spending per capita and there are a strong and positive correlation between national income and national health care spending (For example, Newhouse, 1977; Cullis and West, 1979; Leu, 1986; Newhouse, 1987; Parkin et al., 1987; Milne and Molana, 1991; Gerdtham and Jonsson, 1991a; Gerdtham and Jonsson, 1991b; Hitiris and Posnett, 1992; Govindaraj et al., 1997).

Graph 2. Per capita Health Expenditure and Per capita Income

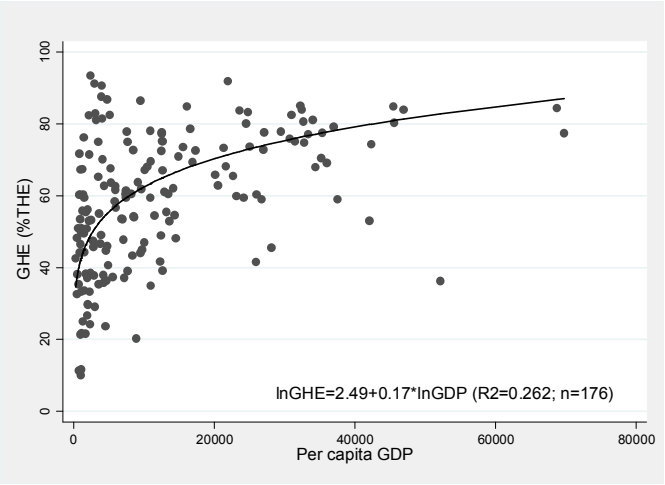


Similarly, studies have found the income elasticity of national health spending is greater than one at developed countries, although there is existence of studies presented evidence to the contrary to that[1]. This fact can be interpreted as health expenditures in countries with high income are used by people to buy luxury component of health services (caring) rather than a necessity components of them (curing) (Hansen and King, 1996; Parkin et al., 1987).

Interestingly, government share of health expenditures also rises with per capita GDP. Graph 3 that presents log-log regression relationship between government health expenditures as a share of health expenditures and per capita GDP (PPP, international dollars) demonstrates that government role tends to expand as national income increases. Of course, as this relationship does not reflect country-specific differences at instruments of government intervention, it does not also imply anything on efficiency of public spending. However, a general pattern exists: the high-income countries are different than the low-income countries with respect to the structure of financing and providing as well as the level of spending. In poorer countries, public money is mostly or entirely spent through public facilities while it goes to private providers in the way of service purchasing from private sector (Musgrove 1996).

[1]Baltagi and Moscone (2012) have found evidences from panel data on OECD countries that health care has the elasticity much smaller than other studies. They interpreted health care as a necessity rather than a luxury good.

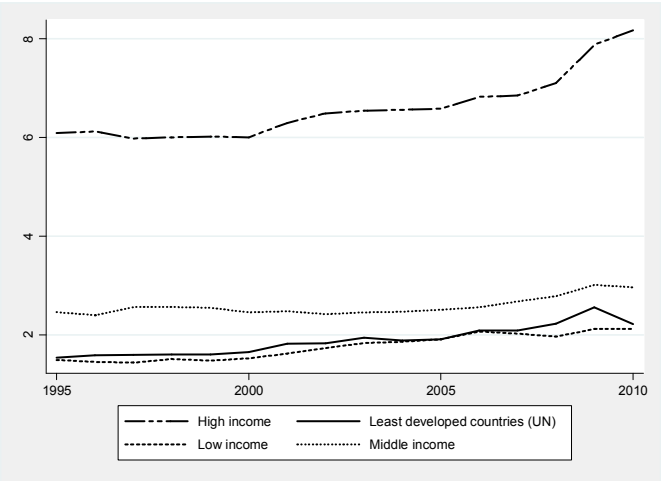
Graph 3. GHE as a Share of Total Health Expenditure and Per capita Income



Another important point is that government participation in health sector shows an increasing trend throughout 20th century. Graph 4 presents time trend in government health spending as a share of GDP by income groups of countries since 1995 that cross-country data available. Of course, the period between 1995 and 2010 may or may not be representative of the general long-term trend among countries. The long term analyses of health spending also display that particularly industrialized countries have experienced a steady increase in health spending in the manner of per capita and as share of GDP in the postwar era (Matteo and Matteo, 1998; Huber and Orosz, 2003). On the other hand, it is difficult to make any generalizations by income levels because different countries have different absolute levels of spending. Despite of all, there is a discernible patter of public health spending during 1995-2010: although GHE as a share of GDP has a trend to increase for all country groups, this tendency at high income countries is more pronounced and stronger. On the other hand, while there is a slight decrease in the middle and the low income countries after the crisis of 2008, for some countries, public health spending has continued to increase through the period of the crisis even.It should be noted that this time trend does not consider the changes in government health spending might have been substituted by corresponding changes in social security systems.

Graph 4. Time Trend of Public Health expenditures

as % GDP

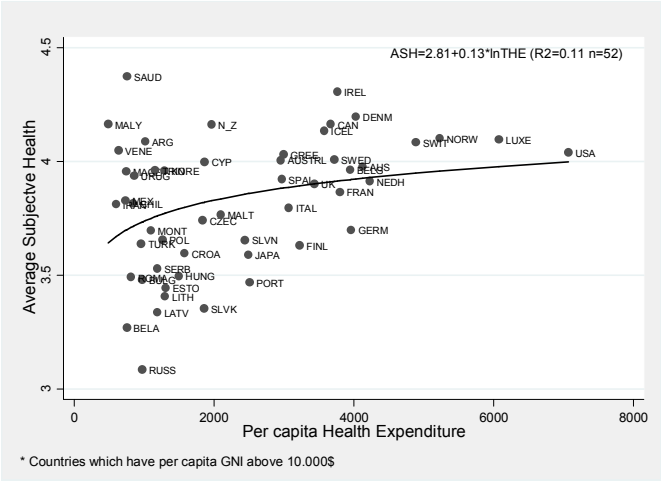


Self and Grabowski (2003) display that public health spending does not serve as an effective measure of the health for the developed countries which have the large public sector interventionsto health sector. On the other hand, public health spending is a significant determinant of health in the middle income and less developed countries. However, these countries have relatively small public spending on health care. Moreover, the low and the middle income countries badly use their limited resources,since public health spending goes to expensive and non-essential services rather than essential health services which have strong impact on mortality rates. Thus, it is a matter not only size of public spending but also its composition and scopeto improve health outcomes.

4. MEASURING HEALTH OUTCOMES AND THEIR RELATIONSHIP TO SPENDING

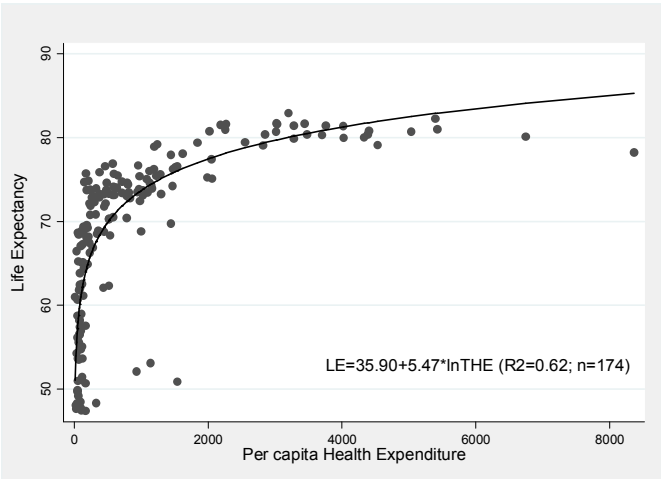
There is no a comparable general measurement on performance of health system or of health outcomes. Indeed health status can only be approximated through related factors that can be measured. In general, there may be two separate measurement of health status: *objective (observed) health status* and *subjective (perceived) health status* (Murray et al., 1994). Empirical studies on impacts of health expenditures mostly use objective health indicators such as life expectancy and mortality rate, although they are an inadequate proxy for health care performance since they just measure years of life but do not reflect the quality of the life. On the other hand, observable indicators are heavily influenced by factors external to the health care system.

Graph 5. Average Subjective Health and Total Health Expenditure



Subjective health status is based on health feeling self-assessment and self-reported. For instance Graph 5 uses a question from World Values Survey (WVS) and Europe Values Survey (EVS) to measure perceived health status. The question with five-point scaled (1 indicates very good; 5 indicates very poor) that indicates average subjective health statement is as following: "All in all, how would you describe your state of health these days?" The scale was coded reverse and then country averages were calculated for aims of the analysis in the Graph.

Graph 6. Life Expectancy and Health Expenditure

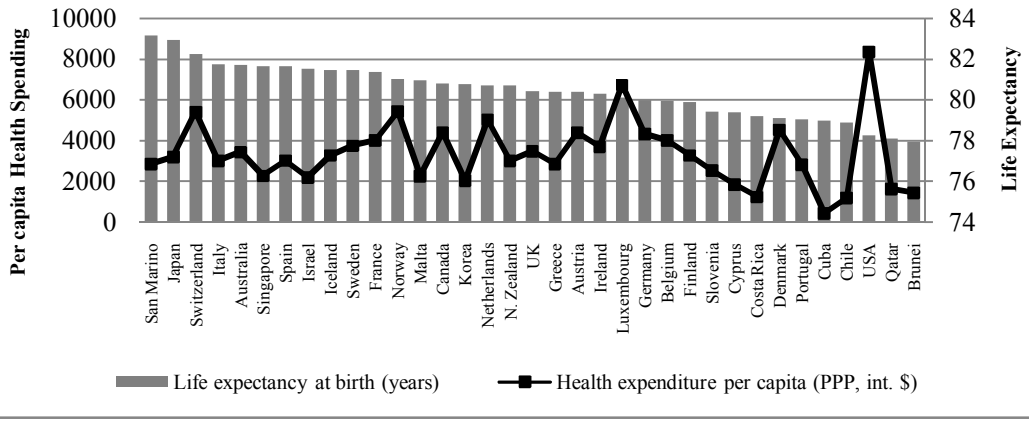


Undoubtedly, subjective evaluations are a measurement that has some problems. They are strongly influenced by emotional experiences and cognitive biases created through distinction between experiencing-self and remembering-self that introduced by Kahneman and Riis (2005). Despite of this, as can be seen from Graph 5, there is a linkage between subjective health status and health expenditures. Murray et al. (1994) argued that perception of ill health may increase with income because of more accessibility to health care and more education that makes people understand more about their health. As a result, health expenditures will be increase, although it is only loosely related to objective health. From this perspective, private health spending seems more likely to respond to subjective need while government health expenditure might be expected to derive more from objective need as measured mortality and disability (Murray et al., 1994).

In this section, it will only be evaluated the life expectancy at birth with relation to health spending as an objective health indicator, since infant mortality and child mortality will be analyzed in cross-sectional regressions in the next section.

Graph 6 shows the relationship between life expectancy and per capita health spending. As a general viewing, the life expectancy rises as health spending rise. However, these results must be interpreted with caution. First of all, since health status is very strongly related with income level, the effect of income should be taken into consideration in comparison of spending. Otherwise it may falsely appear that more health expenditure is extremely effective on better health outcomes (Musgrove, 1996).

Graph 7. Life Expectancy vs Per capita Health Spending



Graph 7 presents the life expectancy and per capita health spending at the top 35 countries ranked by the highest life expectancy. Despite the wide gaps, higher spending on health care does not necessarily prolong lives. For example the United States spent more on health care than any other country in the world (international $8361, PPP) but has 78.24 years of life expectancy. There are many countries achieved higher life expectancy with lower spending. Cuba which has 78.96 years of life expectancy spends only $431 per person on health care. It can easily be observed that some countries have fewer levels of expenditure and of income while they can have longer life. But this simple analysis does not consider income equalities in a country, genetic and geographic factors. The life expectancy varies not only by spending level but also by country-specific factors such as ethnic characteristics and environmental factors such as safe water and air. Of course, it should be also considered the differences at health policy between countries. Cuba has a universal health care

system and one of the highest doctor-to-patient ratios in the world, despite of economic problems in contrast to the United States. Despite all this, countries with higher spending generally tend to have longer life expectancy and we can expect as important income and spending on both objective and subjective health status.

5.CROSS-SECTIONAL REGRESSION ON PUBLIC HEALTH SPENDING AND HEALTH OUTCOMES

5.1. The Data and Variables

This section analyze the strength of association between health outcomes (infant mortality rate and under five mortality rate) and public health expenditures together with a set of some major socioeconomic determinants, using cross-national data available. Table 1 describes the variables and their summary statistics, which used in regression. This analysis seeks to answer question that do countries that do well in health performance have greater public spending on health. The data contains a sample of 131 countries data available.

Table 1: Descriptive Statistics and Definitions of Variables

Variable	Mean and Std. Dev.	Min-Max	Definition and Source
Mortality Under 5	41.06927 (45.33741)	2.6-188.8	The probability per 1,000 that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates. (**Source**: WB, World Development Indicators)
Infant Mortality	28.95475 (27.90292)	1.8-120.9	The number of infants dying before reaching one year of age, per 1,000 live births in a given year (**Source**: WB, World Development Indicators)
GDP per capita	12286.41 (13467.83)	316.4715-9797.94	GDP per capita, PPP (constant 2005 international $) (**Source**: WB, World Development Indicators)
GHE (%GDP)	4.050765 (2.307055)	.5566954-2.90114	Ratio of public expenditure on health care to GDP (**Source**: WB, World Development Indicators)
GHE (%THE)	58.19151 (19.05018)	10.03447-93.38888	General government expenditure on health as a percentage of total expenditure on health (**Source**: WHO, Global Health Observatory Database)
Law and Order	3.695489 (1.305342)	1 - 6	A score that consists of two sub-components. The Law sub-component is an assessment of the strength and impartiality of the legal system, while the Order sub-component is an assessment of popular observance of the law. (**Source**: the PRS Group, International Country Risk Guide, www.prsgroup.com)
Expected Years of Schooling	12.30114 (2.988779)	4.4 - 18	Number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life (**Source**: UN, Human Development Indicators)
Population 0-14	29.08645 (10.53455)	13.35815-48.96926	Population ages 0-14 (% of total) (**Source**: WB, World Development Indicators)
THE (%GDP)	6.831976 (2.674157)	1.810075-17.88733	Ratio of total health expenditure to GDP (**Source**: WB, World Development Indicators)

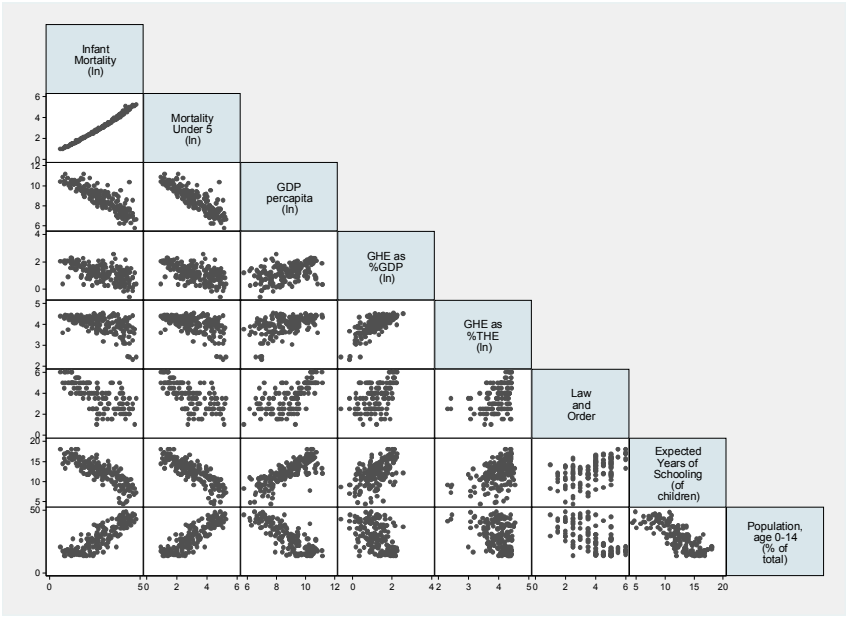
As mention earlier, a numerous empirical studies find income level of country (mostly per capita GDP) and health resource variables (such as physicians per capita, hospital beds per capita) as significant to explain health outcomes. According to empirical findings, while income is always significant, other variables rarely have large impacts (Kim and Moody, 1992; Musgrove 1996; Pritchett and Summers, 1996; Schell et al., 2007). However, studies on advanced countries find as weak relationship between health outcomes and income levels (e.g. Hitiris and Posnett, 1992; Judge et al., 1998). This fact caused some researchers to turn to differences in the distribution of income as a determinant of differences in health outcomes (e.g. LeGrand, 1987; Wilkinson, 1992; Smith, 1996).

Many studies on public health expenditures find that impact of public expenditures to health status is relatively small (Kim and Moody, 1992; McGuire et al., 1993; Aiyer et al., 1995; Musgrove, 1996; Filmer et al., 1998; Filmer and Pritchett, 1999; Schell et al., 2007). Furthermore interestingly, Berger and Messer (2002) found that increases in the publicly financed share of health spending are associated with higher mortality rates in OECD countries which have high level of health spending. However, Anand and Ravallion (1993), Bidani and Ravallion (1997), Jamison et al. (1996) and Hall et al. (2012) find a significant impact of public health expenditures on health outcomes.Bidani and Ravallion (1997) find public spending to have positive influence for the poor, despite of weak impact for the non-poor. Weak links between public spending and health comes steers some studies to use politic predictors such as governance, ethnic heterogeneity, politic system of country as a determinant of health outcomes. For example Rajkumar and Swaroop (2008) find that public health spending in countries that have good governance has a stronger negative impact on child mortality.Ghobarah et al., (2004) find civil wars and ethnic diversity in a country is significant political factors to explain the life expectancy.

$$\ln (H_i) = \beta_1 \ln (GDPi/Ni) + \beta_2 \ln (GHE_i) + \beta 3\ X_i \qquad (1)$$

To estimate the simple heath production function which described at equation 1, we use infant mortality rate and children (under 5) mortality rate as health outcomes (Hi); per capita GDP (GDP/N) as an indicator of income level; share of public expenditures (GHE) as a fraction of GDP and as a fraction of total health expenditures; structure oflaw and order as a proxy of governance at country leveland some socio-economic variables (expected years of schooling, population level of ages 0-14, region dummies, total health expenditures as share of GDP) to indicate country's social capability and structure (X_i). A visual analysis of scatter plots of dependent variables versus each predictor variable is presented at Graph 8.

Graph 8. Scatter-Plot Matrix of Variables



5.2. Statistical Procedures

While we are interested in effects of public health expenditures on health outcomes, we mainly use Ordinary Least Squares regression (OLS) to estimate equation 1. However, in order to address the issues of robustness, we use additional econometric procedures. We used the Shapiro-Wilk W test to check normality of residuals, the Cook-Weisberg test and White test for heteroscedasticity and Ramsey regression specification error test to detect specification error.

Our test of functional form suggests that the log-log specification is appropriate. We used log transformations for dependent variables, income variable and expenditure variables. Empirical literature on health production function has also used commonlythe log-log specification which follows Cobb-Douglas production function(e.g. Pritchett and Summers, 1996; Filmer et al., 1998; Wang, 2002; Gupta et al., 2002; Berger and Messer, 2002; Hall et al., 2012).Log-log function not only allows determining non-linear relationship between mortality and income/spending but also it may be needed to correct skewness of the data. On the other hand, this convenient transformation makes easy interpreting of coefficients because they provide elasticities that be reported the percentage change in dependent variable for a 1% change in independent variable. This is a useful way to compare empirical results because it is scale neutral.

We adapted two main robustness checks to correct problem of 'outlier' countries, following Filmer and Pritchett (1999). Firstly, the two country observations with the largest impact on the parameter vector are dropped from the analysis. Secondly, we used median regression in order to minimize

the sum of absolute derivations. As it is be known, median regression is much less sensitive to influential observations than OLS.

In order to verify importance of impact, we use various specifications. The health regressions are robust to various specifications. When dummy variables for regions are added, total health spending remains significant, with estimated elasticity of health status with respect to spending roughly about the same. The signs of the dummy variables also suggest that other regions have better health status than Sub-Saharan Africa, on average.

5.3. Results

Table 2 presents results for regressions performed in analyses. The OLS regression in Column 1 of Table 2 shows that higher public expenditures on health (as share of GDP) appear to be associated with lower under-5 mortality. Elasticity is –0.22. Furthermore, the effect is statistically significant at the 1% level. To check robustness of this result, we can look at results of median regression presented in column 2 of Table 2. Although slightly smaller in absolute terms (-0.165 vs. -0.22), results are similar and still significant (at 5% level).

Column 3 and 4 use infant mortality as dependent variable. Moreover, in column 4, 5 and 6, it was used public health expenditures as a share of total health expenditures to see if public share in health sector has effect on health outcomes. We are more interested in this variable if cross country differences on health financing system can explain differences at health outcomes. Results for Column 3 are similar to column 1 with elasticity of -0.20,at 1% significant level. This implies that a 1% increase in government health spending as a share of GDP is associated with a 20% decrease in infant mortality. Results for column 4, 5, 6 indicates that GHE (%THE) has more empirical significant than GHE (%GDP). When it is used GHE (%THE) as a predictor, elasticities have raised to -0.23, -0.33 and -0.32 for column 4, 5 and 6, respectively. A 1% increase in government share of total health spending is associated with a 33% decrease in child mortality and with 32% decrease in infant mortality at full specifications. Results are still statistically significant.

Table 2: Health Outcomes and Public Health Expenditures (2010)

	(1) OLS	(2) Median Regression	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Dependent Variable →	Mortality Under 5 (ln)	Mortality Under 5 (ln)	Infant Mortality (ln)	Infant Mortality (ln)	Mortality Under 5 (ln)	Infant Mortality (ln)
Independent Variables ↓						
Constant	5.69*** (10.67)	5.50*** (9.48)	5.22*** (9.81)	5.65*** (9.89)	6.61*** (10.23)	6.03*** (9.42)
GDP per capita (ln)	-0.25*** (-4.70)	-0.23*** (-3.97)	-0.23*** (-4.39)	-0.19*** (-3.50)	-0.19*** (-3.01)	-0.16*** (-2.67)
GHE (%GDP) (ln)	-0.22*** (-3.13)	-0.17** (-2.13)	-0.20*** (-2.90)			
GHE (%THE) (ln)				-0.23** (-2.48)	-0.33*** (-3.69)	-0.32*** (-3.60)
Law and Order	-0.11* ** (-3.13)	-0.10*** (-2.63)	-0.11*** (-3.24)	-0.11*** (-3.13)	-0.07* (-1.90)	-0.07* (-1.91)
Expected Years of Schooling	-0.06*** (-2.68)	-0.05** (-2.12)	-0.04** (-2.08)	-0.05*** (-2.68)	-0.06*** (-2.95)	-0.05** (-2.42)
Population 0-14	0.03*** (4.13)	0.02*** (3.31)	0.02*** (3.99)	0.03*** (4.25)	0.03*** (4.20)	0.03*** (4.08)
Dummy for Sub-Saharan	0.62*** (5.59)	0.66*** (5.30)	0.46*** (-3.38)	0.44*** (-4.51)	0.63*** (5.64)	0.47*** (4.22)
Dummy for OECD	-0.27** (-2.49)	-0.36*** (-2.97)	-0.36*** (-3.38)	-0.46*** (-4.51)	-0.40*** (-3.28)	-0.51*** (-4.19)
Dummy for High In. Non-OECD					-0.30** (-2.11)	-0.34** (-2.35)
THE (%GDP) (ln)					-0.21** (-2.34)	-0.20** (-2.18)
R-squared	0.9287	0.7538	0.9178	0.9164	0.9317	0.9220
n	129	129	129	129	129	129

Notes: * Indicates significance at the 10% level. ** Indicates significance at the 5% level. *** Indicates significance at the 1% level.
The R-Squared in column 2 is the pseudo R-Squared.
t-statistics are shown in parentheses
It has dropped Singapore and Azerbaijan for specifications in Columns (1), (2), (3) and (4); Singapore and Trinidad-Tobago for those in Columns (5) and (6) as countries with largest influence on parameter vector due to being extreme outliers.
In classification of countries, it was used World Bank classification. Turkey, Chile and Mexico were not included in dummy for OECD, since they were handled in their geographical classification.

In order to check robustness, when two new predictors are added in Column 5 and Column 6, public health spending remains significant empirically and statistically. Also these two variables (a dummy for high income non-OECD countries and total health expenditures as percentage of GDP) are significant at 5% level.

It was used three dummy variables in regressions. The signs of the dummy variables suggest that other regions have better health status than Sub-Saharan Africa, on average. The coefficient on the variable Sub-Saharan is very strong for under-five mortality, implying that a child mortality rate higher by 63% on average for Column 1, 2 and 5. For all specifications, coefficients are statistically significant. Also it should not come as a surprise that differences at health outcomes for high income countries (OECD and high income non-OECD) is significant.

When non-economic predictors are examined, increasing in expected education levels is associated with decreasing in mortality for both infant and under-five at all specifications. Higher levels of education in the society result in higher health outcomes. Increases in population rate of 0-14 ages are associated with increases in mortality. While findings on education and population are not novel, the score on the law and order that may be a proxy to country's societal governance is also a significant predictor of health outcomes.

Our results show that public health spending has statistically significant impact on both infant mortality and child mortality, albeit economic meaning of this impact is not large relatively. Undoubtedly, it should be taken into consideration of interpreting this results that impact of public spending on health is not an immutable parameter and results will be sensitive to the sample used (Filmer and Pritchett, 1999).

5.CONCLUSION

This study has employed the cross-country data set to examine determinants health outcomes and to discuss significance of public spending on health care. From cross-country regressions, we have found not only the income level as slightly less significant but also public health spending as slightly more significant compared with previous studies (for example Filmer and Pritcher, 1999). Regressions are robust with various specification and statistical procedures.

Although it is difficult to draw policy conclusions from cross-country data as much depends upon the country-specific situation, some points seem clear from discussion in this chapter. Government intervention on health care is a matter not only through the size of public spending on health but also the composition of spending and other instruments used for intervention. It cannot suggest a simple prescription for all countries. In developed countries which have high level of public health spending, increasing the level of public sector involvement would possibly not bring about improvement in heath. Elasticity of health spending in these countries displays the health care to be a luxury good.

Public health spending has especially significant impact for essential health services at the low income countries and the poor people who don't have chance health care services supplied by private sector. On the contrary, despite the potential importance of state intervention in poor countries, these countries have little amount of public health spending compared with developed countries. On the other hand, in countries with the low and the middle income, current public health expenditures are not used in an effective way because of heavy governance and decision-making problems which they suffer.

Also, the social and demographic factors other than spending and income variables have impact on desired health outcomes. Therefore, government intervention and public spending on health care should be used as targeted to essential health care, the poor according to country-specific situations instead of a general increasing or decreasing for all countries. The low and middle income countries should make their spending on health care productive, accessible and targeted for particular outcomes, considering their limited public sources.

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