Economics of Health System Governance and Financing in Nigeria

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PUBLIC SECTOR HEALTHCARE FINANCING AND HEALTH OUTCOMES IN SUB-SAHARAN AFRICAN COUNTRIES

Akanni O. Lawanson

Introduction

Eleven years after the declaration of Millennium Development Goals (MDGs), and four years to 2015, the end of the set period, there is substantial fear that majority of the Sub-Saharan African (SSA) countries may not achieve the MDGs. Three of the eight MDGs, focus on health-related indicators. While among the health-related indicators include reduction of under-five mortality by 75%, maternal mortality by 65%, and prevalence of underweight among children by 50% are targeted (UN 2004), above 20% of under-five deaths happen in the first week of birth, and can be attributed primarily to malnutrition in the mother and fetus, and poor antenatal care (UN 2002). Studies have shown strong evidence that the mortality decline in children in high-income countries is attributable to improved nutrition and medical technological progress (Cutler and Miller 2005; Cutler et al. 2006). While country levels of under-five mortality rates vary from 4 to over 250 deaths per 1000 live births (Bokhari et al. 2007), SSA countries' average is 144 deaths per 1000 live births for 2008 (WDI 2010). The region has on the average only succeeded in reducing under-five mortality rates by only 22% from 185 in 1990 to 144.3 in 2008. Similarly, there still exist substantial gaps between the achievements in reduction of infant mortality rate in the MDGs target. From a prevailing rate of 108.7 deaths per 1000 live births in 1990, it only dropped by 21% to 86.1%, on average by 2008. There is, therefore, the need to take measures to significantly alter the health outcomes of SSA countries.

One of the most basic ways in which governments can alter their healthcare delivery systems is to increase or decrease public funding of healthcare expenditures (Berger and Messer 2002). Governments in the region may require stepping up budget allocation to the sector to facilitate increased access to health by the citizens. If the health-related MDGs targets are to be achieved to any appreciable degree among the SSA countries, and the general health status improved, there may be need for increased efforts to stimulate resource mobilization for the health sector. In realization of need for increased resource allocation to the health sector, the Abuja Declaration of 2001 was reached by the heads of governments of African countries. The declaration stipulates that minimum of 15% of government budget should be allocated to the health sector. While a number of countries have in some years complied with the declaration, many still allocate substantially less than 15% of government expenditure to the health sector.

While there are strong evidences in the literature on the linkage between wealth and health, the implications of variations in public funding of health remain controversial. Lack of consensus on the extent to which increased public healthcare expenditure is beneficial to health outcomes remains a focal issue in healthcare policy. While many studies (such as: Gani 2008; Bokhari et al. 2007; Bhalotra 2007; Berger and Messer 2002; Gianonni and Hitris 2002; Hitris and Nixon 2001; Gerdtham and Jonsson 2000) have examined the impact of public healthcare spending on health outcomes in large number of developing countries, little research has been conducted on the healthcare financing and health outcomes in Sub-Saharan African (SSA) countries. There is a dearth of empirical evidence to motivate policy interventions in support of increased allocation of public spending to the health sector in SSA countries. Given the prevalence of preventable diseases, high levels of infant and under-five mortality rates, and low levels of budgetary allocations to health sector, the effect of healthcare financing on health outcomes in the SSA countries deserves to be investigated. The focus of this chapter is therefore to empirically investigate the determinants of health outcomes in SSA with special focus on the impact of public expenditure on health.

This paper focuses on the effects of government health expenditures on health outcomes, measured by infant mortality, under-five mortality, crude birth rate, and life expectancy.

Background to the Chapter

The issue of inadequate public allocation of resources to the health sector has been at the heart of the poor health outcomes that characterize many developing countries. Insufficient healthcare facilities and poor accessibility to healthcare has over the years worsened the health status of most developing countries. Investigation of healthcare expenditure and health outcomes has thus been a subject of ongoing inquiry in the literature[1].There remains a dearth of evidence at the macro-level on the benefits of increased health system spending (Martin et al. 2008). As in most developing countries, most of the SSA countries are classified into low-income group, with few qualifying as middle-income group. More than 62% of the countries in the region are in the low-income group, while 21% and 15% are in the group of lower- and upper-medium-income, respectively (WDI 2010). The region's population health status ranks poor. Not only is life expectancy rate in the region very low, the incidence of infant mortality and preventable diseases are highest in the region globally.

More than 42% of global deaths attributable to childhood and maternal under-nutrition occur in SSA. Less than half of births in SSA are attended to by skilled health staff, which partially explains the progressive increase in the average mortality rate among female adults in the region from 344 per 1,000 female adults in 1998 to 362 per 1,000 female adults in 2008 (WDI 2010). For a number of countries, such as: Lesotho, South Africa, Swaziland, Zambia, and Zimbabwe, the rate is more than 500 per 1,000 female adults in 2008. Though the infant mortality rate in the region has declined over the decades, it took nearly four decades for the

[1] Newhouse, 1992; Hitris, 1997; Di Matteo and Di Matteo, 1998; Berger and Messer, 2002; Gerdtham and Jonsson, 2000; Hitris and Nixon, 2001; Gianonni and Hitris, 2002; Bokhari *et al.*, 2007; Bhalotra, 2007; Costa-Font and Pons-Novell, 2007, Gani, 2008.

region to achieve 36% decline in infant mortality from 135 per 1,000 live births in 1970 to 86 per 1,000 live births in 2008. Country specific infant mortality rates in the region in 2008 is well above the average of 86 per 1,000 live births in 15 countries. Similar picture appears to depict itself with respect to under-five mortality rate in the region. While the rate progressively declines from about 236 per 1,000 live births in 1970 to 144 per 1,000 live births in 2008, the rate remains alarming compared to other developing countries of the world, and even worse in more than 15 countries. In Angola and Somalia, the rates are 200 and above per 1,000 live births. Similarly, the prevalence of HIV as a percentage of population ages 15-49 has remained over the last one decade well over 5%. The devastating effect of the scourge has progressively taken its toll on the region. While the prevalence rate was less than 2.2% in 1990, the infection almost tripled to above 5.5% in 2000, however, the rate has slowed down since year 2000, dropping continuously to less than 5.0% in 2007, and has remained around this level since. The decline could have partially been due to the intense efforts engendered by the Millennium Development Goals.

Under-five children constitute about 90% of the 11milion children dying annually worldwide (Bokhari et al. 2007). Unlike in the rich countries, where less than 1% of deaths are children, as high as 30% of deaths in poor countries are children (Cutler et al. 2006). According to Jones et al. (2003), at least 10 million under-five children die yearly mainly from preventable (curable) conditions that seldom kill children in rich countries.

Statistical evidences abound as to the fact that poor health is concentrated among the poor people in poor countries (Bhalotra 2007). While the rich are more likely to obtain medical care when sick (Makinen et al. 2000), the poor are usually limited in terms of their choice of healthcare. It has been shown that the poor are significantly less healthy than the rich (e.g. Gwatkin 2000; Wagstaff 2000). The high likelihood of the poor to obtain healthcare from publicly provided facilities underscores the importance of public healthcare spending on health outcomes. Hence, public healthcare financing can assist in bridging the health status gap between the rich and the poor.

Despite the Abuja declaration, most African countries are reluctant to increase the budget allocation to health to the prescribed percentage. The responses of governments in SSA countries to the Abuja Declaration have been mixed. Between 2003 and 2007 only seven of the SSA countries have at any year allocated up to 15% of the total government expenditure to health[2]. An empirical investigation of the impact of public expenditure on healthcare may therefore be useful in convincing SSA countries' governments to be more favourably disposed to the Abuja declaration, which is what this paper set out to achieve.

Literature Review

The effect of government health expenditure on health outcomes remains a topical and controversial issue in the literature. Both the positive and negative effects have been found by many studies. Studies have both found evidences in support of and against government health expenditure reducing mortality rates. While public financing of healthcare expenditures may improve access to healthcare and may thus improve health outcomes, increases in public financing may lead to different and possibly less efficient production of healthcare and perhaps worse health outcomes (Berger and Messer 2002). Less productive mix of services or less efficient provision of services may arise from increases in public financing of healthcare.

Early research work on health expenditure focused more on the relationship between healthcare expenditures and Gross Domestic Product (GDP). However, recent research focus has been on the determinants of health outcomes across countries, with emphasis on differences in income and public share of health expenditure. Pritchett and Summers (1996) observed that richer countries do have longer life expectancies and lower mortality rates. However, a small or statistically insignificant relationship between health outcomes and income levels among advanced countries, such as the OECD members has been found by some studies. For example, Judge et al. (1998) find an insignificant relationship between health

[2] Botswana, Liberia, Malawi, Mozambique, Niger, Rwanda, and Zambia.

expenditures as a proportion of GDP and mortality rates, while LeGrand (1987) using two sample regressions, found the public share of expenditures to be positively correlated with mean age of death, but the relationship is statistically insignificant in the 23 country sample and marginally significant in the 17 country sample. However, Hitiris and Posnett (1992) find that mortality rates is significantly lowered by increases in health expenditures per capita, although the effect is rather small. While some studies have focused on income inequality, and concluded that it is associated with declining health outcomes (e.g. Smith 1996; Wilkinson 1992; LeGrand 1987), it has been argued that only very modest support of this view applies to rich industrial countries (Judge et al. 1998). Considering lifestyle factors such as consumption of cigarette and alcohol Wolfe (1986) argues in support of a positive tie between medical expenditures and health status.

Furthermore, positive association of per capita health spending with life expectancy at birth, at age 60, and at age 80, and negative association of the same with potential years of life lost, infant mortality, and prenatal mortality have been reinforced by OECD (1995) report. Public health expenditure is considered to be an important factor in influencing health outcomes in developing countries, particularly in terms of reducing the incidence of infant and child mortality (Gani 2008), more so that the relevant interventions in terms of immunization and oral rehydration therapy are low cost (Deaton, 2006). Specifically, government spending on public health has been found to be a significant contributor to health outcomes (Bokhari et al. 2007; Bhalotra 2007). Most studies in the literature have been characterized by either cross-sectional or panel data analysis, with varying number of countries covered. Among the cross-sectional based studies are: Anand and Ravillion (1993) who, using 1985 data for 22 developing countries found health expenditure to raise life expectancy. Expenditure on health has also been found to contribute to the reduction in infant mortality rates in poorer regions, but not in richer regions (World Bank 1955). The impact of public health spending on the health of the poor was also found to be beneficially significant (Bidani and Ravallion 1997). In two separate studies (Gupta et al. 1999; and Gupta et al. 2001), using samples of 50 and 70 developing

countries respectively, empirical evidence was established to support the claim that greater public spending on healthcare reduces childhood mortality. Similarly, the chapter by Hojman (1996) involving countries from Central American and the Caribbean showed that public health spending has a significant impact on health status.

While Nixon and Ulmann (2008) concluded in their chapter that healthcare expenditures are among the most important factors in the lowering of infant mortality, they found them to make only marginal contribution to the improvement of male and female life expectancy. Studies, such as Anand and Ravallion (1993), Bidani and Ravallion (1997), and Jamison et al. (1996) also claim to have a significant impact of public spending on health outcomes. Apart from contributing to health outcomes generally, public expenditure on healthcare reduces the poor-rich differences in health outcomes (Gupta et al. 2001; Gakidou and King 2000). In this regard, Bidani and Ravallion (1997) found public spending to have beneficial effect on the health of the poor. Examining the relationship between expenditure and outcomes across 10 Canadian provinces over period 1978-1992, Cremieux et al. (1999), conclude that lower health spending is associated with a significant increase in infant mortality and a decrease in life expectancy. Also, using 20 OECD countries from 1960-1987, Hitiris and Posnett (1992) concluded that increases in health expenditures per capita significantly lower mortality rates, though the effect is rather small.

Musgrove (1996) in a review of some studies concludes that the same answer is obtained from 'multivariate' estimates of the determinants of child mortality: while income was found to be consistently significant, the health share in GDP, the public share in health spending, and the share of public spending on health in GDP are not. However, Judge et al. (1998), considering health expenditure as a proportion of GDP and mortality rates, found an insignificant relationship. Wolfe (1986) argues that there is a positive link between medical expenditure and health status. On the other hand, a number of studies have refuted the existence of positive relationship between health expenditure and health outcomes. According to Bokhari et al. (2007), the link between

government expenditures and health outcomes is not necessarily present. First, they argued that an increase in public health expenditures may result in a decrease in private health expenditures: a household may divert its funds towards other uses once the government increases its provision of basic healthcare. Second, the incremental government expenditures may be employed on the intensive rather than the extensive margin. Third, even if extra funds are applied extensively to healthcare (e.g. more staff at hospitals, adequate stocking of medicine), but complementary services, both inside and outside the health sector, are not there (e.g. lack of roads or transportation to hospitals and clinics, subsidized prices for medication, etc.) the impact of extra government health expenditures may be little or none.

Cochrane et al. (1978), using a cross-sectional data from 18 developing countries to chapter the relationship between mortality rates, GNP, and consumption of health inputs, generally found the indicators of healthcare inputs not to be associated with mortality rates. Similarly, Berger and Messer (2002), examining the determinants of health outcomes across countries using OECD data for 20 countries from 1960-1992, found increase in the share of health expenditures that are publicly financed to be significantly associated with higher mortality rates. They concluded that not only does the level of healthcare expenditures matter in determining mortality rates, but so does the mix of expenditures, as represented by the type of finance.

Concern has been raised on the weak robustness of available macroeconomic indicators often used to approximate population health status. Sector outcomes might be measured in a variety of ways, but the most obvious is to consider some measure of improvement in life expectancy, possibly adjusted for a quality of life, in form of a quality-adjusted life years (QALY). Mortality rates and life expectancy are the most often used measure of health outcomes. Indeed life expectancy and mortality rates, commonly adopted by researchers, can only partially reflect the health status of a population and it is difficult to identify feed backs and causality links between health expenditures and health outcomes, especially for developed countries (Nixon and Ulmann 2006).

Given that risks associated with child birth and life in the first year of an infant are reduced by better healthcare facilities and procedures, infant mortality has been considered to be more typical and reliable health outcome than life expectancy. Gupta and Mitre (2004), noted that long-term improvements in the health status of populations are best reflected in infant mortality and life expectancy rates. Age-specific or infant mortality have been particularly adopted as measure of mortality rates. According to Sen (1998), infant mortality, under-five mortality and crude death rates are considered to be good indicators of the health status of a population. While life expectancy at birth has been mainly used, many other studies have adopted life expectancy at other ages different from birth, such as at 40, 65, 80 years, and according to gender: male and female.

Nixon and Ulmann (2008) provide a comprehensive review of other explanatory variables that have been included in the analysis of expenditure effect on health outcomes. The norm in the studies in the literature is to control for other factors considered to also possibly affect health outcomes, by including different control variables in investigating the relationship between public healthcare expenditure and health outcomes. Prominent among the variables often controlled for is income level, either as GDP, GDP growth, or per capita GDP. Others in the literature are share of external funding of health; measures of age structure such proportion of population in a specified age-group: under 15 years, over 65 years; environmental variables such as urbanization, fertility rate, and availability of immunization.

Review of Theoretical Approaches

Nixon and Ulmann (2008) identified two distinct approaches commonly adopted by researches in this field of health expenditure and health outcomes. First approach (micro) is the human capital theory based on Grossman (1972), and the second is the consideration of health as a production function utilizing aggregate or macro-level data. As a consumption good, individual maximizes the consumption of health subject to budget constraints, and a number of endogenous and exogenous variables influencing

individual's health. As part of further development of the Grossman's household production function, the consumer behavior is modelled to account for the gap between health and medical care as one of the many inputs into its production. The theory posits that investment in health is a process in which medical care is combined with other relevant factors to produce new health, which, in part, offsets the process of deterioration in health stock (Nixon and Ulmann 2008). The human capital theory, at the level of individual regards health as a consumption and capital good. Health is regarded as a capital good, that is inherited, and depreciates over time.

The aggregate level production function approach views health as an "output of a healthcare system", which is influenced by the "inputs" to the system. This approach considers healthcare expenditure or health resources as the inputs, and health outcomes as the output. The two approaches are basically classified as "production functions", in which similar variables have been used in the literature to investigate the relationship between health expenditure and health outcomes. However, while empirical studies found health at the micro to be a normal good, at the macro level, health sector has been confirmed to be a luxury good (Nixon and Ulmann 2008). Thus consideration of micro-level results for health policy decision making at the macro-level has been analytically and empirically established to be misleading (Piatecki 1996).

Theoretical Framework

The underlying theoretical framework for the estimation of health outcomes in this paper is provided in Grossman (1972), in which investment in health is specified as a function of medical care, time spent investing in health, with education as a technological shifter, while allowing for other goods beside medical care. Therefore, our theoretical model adapted from Martin et al. (2008) is based on production function approach. Government budgets are usually allocated among the different sectors of the economy. We assume a given government revenue y, and that total expenditure allocation to each sector of the economy cannot exceed this revenue.

Government has lump-sum revenue, and must annually decide how to allocate its expenditure across J sectors (j=1.....J). For *j*th sector, there is a production function *fj*(.) that indicates the link between government spending x_j on sector *j* and sector outcomes S_j. The nature of production function confronted by each sector of the economy will depend on some peculiarity of the sector (which we denoted n_{ij}) and broader general environmental factors z_{ij} affecting the activities in each sector (such as factor-input prices, infrastructure facilities, and other uncontrollable influences on production function).
Increased expenditure then yields improvement in sector outputs. That is:

$$S_j = f_j(x_j, n_{ij}, z_{ij}); \quad \frac{\partial f_j}{\partial x} > 0; \ \frac{\partial^2 f_j}{\partial x^2} < 0 \qquad (1)$$

Replicating equation (1) for the health sector, increased health expenditure yields improvement in health outcomes:

$$S_{jh} = f_j(x_j, n_{ij}, z_{ij}); \quad \frac{\partial f_j}{\partial x} > 0; \ \frac{\partial^2 f_j}{\partial x^2} < 0 \qquad (1b)$$

We assume there is an economic wide social welfare function *W*(.) that embodies output/outcomes across the sectors of the economy. Assuming no interaction between sectors, government allocates its total budget *y* so as to maximize total welfare subject to budget constraint and the production functions for each sector:

$$\max \square \ W(S_1, S_2, \ldots\ldots\ldots\ldots\ldots, S_3) \qquad (2)$$

$$subject\ to \sum_j x_j \leq y$$

$$S_1j = f_1j\ (x_1j, \quad n_1ij, \quad z_1ij\ ); \ j=1,\ldots\ldots,J$$

Considering the activities in the health sector, the focus of this chapter, we take $H=S_h$, where S_h is the health sector outcomes. This model implies that government allocates its budget across the different sectors of the economy so that the marginal benefit of the last unit of resources spent in each sector is the same. Solving the constraint maximization problem, for the health sector yields the

result that the optimal level of expenditure in the health sector x_h, is a function of the health sector peculiarities, (n_1, n_2,.....n_k), general environmental variables (z_1, z_2,.....z_k), affecting the production of health outcomes, and the budget constraint (y).

$$x_h^* = g_h(n_1, n_2, \ldots\ldots n_k, z_1, z_2, \ldots\ldots z_k, y); \quad i = 1 \ldots\ldots\ldots k \qquad (3)$$

Thus, for the health sector, there exists an expenditure Eq. (3) explaining health expenditure choice and health outcome Eq. (1b) that models the associated health outcomes achieved. This paper seeks to estimate these equations empirically for the health sector.

Empirical Model Specification

As demonstrated in earlier studies, either a micro- or macro-perspectives have been commonly used to quantify the impact of health expenditure on health outcomes. We adopt the latter approach, considering health as the output of a healthcare system, while a collection of healthcare inputs combined with some environmental variables explain the variations. The analysis of the relationship between expenditures and health outcomes is conceived from the premise that health is the 'output' of an aggregate production function which employs variables such as public healthcare expenditure, environment, income and non-income variables as the 'inputs'. Following Gani (2008), our empirical model is based on the structural equation of the general form in equation (4), to chapter the effect of public health expenditure on health outcomes:

$$X_{it} = f(Gh_{it}, V_{it}) \qquad (4)$$

where X is a health outcome indicator reflecting the health status of country i, Gh is public expenditure on healthcare (propose different measures: per capita public spending on healthcare, share of public spending on total health expenditure, share of government budget allocation to healthcare), V is a vector of socio-economic control variables, and t is the time. We propose to test for effect on health outcomes, using the health status indicators: crude death rate (CDR), infant mortality rates (IMR), under-five mortality rates (U5M), and life expectancy (LE). The

choice of variables tested for in our analysis is informed by their being among the predominantly used conventional variables, and data availability for the countries in the chapter. The variables include per capita incomes/GDP growth rate (Y), share external funding of health (D), immunization rates (Z), age structure of the population: proportion of population age 65 and above (P65), and age 15 and below (P15), fertility rates (F), and urbanization rates (R).Therefore, the health outcomes are presumed to be a function of Gh, Y, D, Z, P, F, and R (abbreviation explained above).

$$\ln X^{j}_{it;=} = \beta_0 + \beta_1 Gh_{it} + \beta_2 Y_{it} + \beta_3 D_{it} + \beta_4 Z_{it} + \beta_5 P_{it} + \beta_6 F_{it} + \beta_7 R_{it} + \mu_{it} \quad (5)$$

where *j* refers to the *j*th health outcomes indicator. The error term μ_{it} is assumed to be *idd* $(0, \sigma^2)$. For our regression analysis, we express equation (4) in four sets of reduced forms as below:

$$\ln IMR_{it} = \beta_0 + \beta_1 Gh_{it} + \beta_2 Y_{it} + \beta_3 D_{it} + \beta_4 Z_{it} + \beta_5 P65_{it} + \beta_6 P15_{it} + \beta_7 F_{it} + \beta_8 R_{it} + \mu_{it} \quad (5.1)$$

$$\ln U5M_{it} = \alpha_0 + \alpha_1 Gh_{it} + \alpha_2 Y_{it} + \alpha_3 D_{it} + \alpha_4 Z_{it} + \alpha_5 P65_{it} + \alpha_6 P15_{it} + \alpha_7 F_{it} + \alpha_8 R_{it} + \mu_{it} \quad (5.2)$$

$$CDR_{it} = \gamma_0 + \gamma_1 Gh_{it} + \gamma_2 Y_{it} + \gamma_3 D_{it} + \gamma_4 Z_{it} + \gamma_5 P65_{it} + \gamma_6 P15_{it} + \gamma_7 F_{it} + \gamma_8 R_{it} + \mu_{it} \quad (5.3)$$

$$\ln LE_{it} = \pi_0 + \pi_1 Gh_{it} + \pi_2 Y_{it} + \pi_3 D_{it} + \pi_4 Z_{it} + \pi_5 P65_{it} + \pi_6 P15_{it} + \pi_7 F_{it} + \pi_8 R_{it} + \mu_{it} \quad (5.4)$$

The relationship between public health expenditure and health outcomes is explored using a fixed-effects estimation procedure. The *a priori* expectation of the coefficients for the health outcomes indicators, except LE are: Gh (-), Y(-), D(-), Z(-), P65(+), P15(+), F(-), R(-). For life expectancy indicator, the expected signs of the coefficients are exactly opposite.

The data for this chapter was drawn from the WDI (2010). Data on public health expenditures is only available for the years 2003-2007 therefore the analysis in this paper is limited to this period.

We consider X*ji* as the *j*th health outcome indicator (j=1,2,...J) in country i (e.g. under-five mortality, maternal mortality, life expectancy, etc) and assumed to be related to public expenditures

on health (G_h), income (Y), external funding of health (D), Immunization (Z), age structure of the population (P), fertility rates (F), and urbanization (R). Here we take cognizance of the resultant variation in effect of government health expenditure on health outcomes across countries due to impact of other factors on health outcomes, such as differing levels of income across countries, share of population aged 65 and above, or under 15, and intensity of immunization. This set of heterogeneity indicators across the countries may have a marginal effect on the relationship between government health expenditure and health outcomes. Specified in log form, the equation for health outcomes j in country i is a log function of Gh, Y, Z, P, F, and R.

Estimation Issues

Studies in the literature conventionally employ regression analysis in investigating the effect of public health expenditure on health outcomes. Most studies in the literature have utilized cross-sectional or panel data. Estimation issue often raised centers on the heterogeneous nature of countries often pooled together for analysis. Different countries are at different levels of development, and are characterized by cultural difference which has significant influence on health behavior, and other country-specific peculiarity. Part of the methodological difficulties associated with empirical investigation of the determinants of health outcomes have been identified by Gravelle and Backhouse (1987) to include simultaneous equation bias, and associated endogenous problem. The estimated effect of public health spending tends to be reduced by bias in estimating the impact of public sector expenditures potentially resulting from reverse causation. Similarly, because of uncoordinated tracking of public health spending, another possibly severe problem with health spending is measurement error. There may be unobserved secular changes in mortality that are correlated with variables included in the model, thus biasing the estimated parameters (Berger and Messer 2002). Bokhari et al. (2007) argued that some health outcomes indicators may be causal related to each other while the relationship among others may be only spurious. Single cross sectional data usually do not allow for the control of existence of country-specific differences in health outcomes due to

factors not captured in the model specification. Estimated cross-sectional effects turn out to be bias, with the parameters estimates, if these country-specific factors are correlated with variables in the model. There is always the difficulty of adjusting for all the potential external influences on health outcomes. The difficulty of satisfactorily estimating the impact of health system inputs on outcomes is compounded by the great heterogeneity of healthcare, the multiple influences on outcomes, and rather general nature of the outcome mortality measure traditionally used (Martin et al. 2008).

There is also the problem of bi-direction in causality, especially between health outcomes and income, as better health status might cause higher average income. While Strauss and Thomas (1995) concluded that it is almost certainly true that better health leads to higher income at the micro, however the magnitude of the effect is less clear at the macro level. For instance, mortality rate of children under five effecting income contemporaneously is unlikely, though future effect cannot be dismissed. In this regard, it has been shown that wealthier is causally healthier for the cases of infant mortality, under-5 mortality, and life expectancy (Pritchett and Summers 1996; Kakwani 1993; Pritchett 1997).

This problem is significantly reduced when panel data is used with the inclusion of country and year fixed effects. As with a single year cross-sections, the estimated parameters are more likely to be statistically insignificant than when the pooled data are used (Berger and Messer 2002).However, for studies based on panel data, concern has always been raised on the difficulty in separating the impact of expenditure from a wide range of other temporal influence on health, such as technological advances, epidemiological changes, and variations in broader economic circumstances (Martin et al. 2008).

Our first approach is to estimate Eqs. 4.1-4.4 using Ordinary Least Squares regression (OLS) fixed effect. However, in order to address the issues of robustness, measurement error, and reverse causation we using Two-Stage Least Squares (2SLS) to implement Instrumental Variables (IV) estimation procedure. Instrumental variables estimation is an econometric procedure which uses the variation in a set of exogenous variables for instruments' to

identify the effect of exogenous variations in a variable on the outcome of interest (Filmer and Pritchett 1999). The method relies on the assumption that the instruments are related to the out-come only through their effect on the variable that is being instrumented.

Results

The estimates of equations 5.1 and 5.2 using infant mortality and under-five mortality as indicator of health outcomes are shown in Appendix B, table B-1, while reported in table B-2, are the estimates of equations 5.3 and 5.4 using crude death rates and life expectancy, respectively as indicators of health outcomes. The estimated regressions are specified in their log form, to allow for elasticity interpretation of our estimates which constitute a useful way to compare empirical results. Elasticity is scale neutral, and reports the percentage change in one variable for a 1% change in the other variable. The log transformation of data also allows for adequate capturing of the non-linearity relationships, especially between mortality outcomes and income.

The high explanatory power of these regressions is even more impressive, especially with respect to infant and under-five mortality when one considers the role of measurement error, both in the dependent variables of mortality rates and in the independent variables. Srinivasan (1994) opines to the fact that many researchers do not trust cross-national comparisons because they doubt the data are sufficiently reliable. Despite the difficulties in measuring child mortality, and incomes across countries accurately, the high degree of explanatory power cannot be attributed to this. While about three-quarters of variations in infant mortality is explained by the variables, 83% of variations in under-five mortality is explained by the variables. However, the explanatory power of the crude death rate and life expectancy regressions are very low at less than one-third for the latter, and around 45% for the formal.

A number of the explanatory variables turned out with contrary signs in their coefficients and also significant. Rather than discard such results, we see them as a reflection of some peculiarities about the healthcare situation in SSA. In this category of variables are variations in age structure 65 and above, and 15 and below,

urbanization, as well as fertility rates. Control for the universally acknowledged impact of income on health which works through a variety of indirect channels (e.g., better nutrition, better housing, better sanitation), we included income variable in our estimated regressions. As reported in tables B-1 and B-2, the mortality elasticity with respect to income is highest for infant mortality ranging between -0.15 and -0.18, which implies that a 1% increase in income is associated with a fall of infant mortality of between 0.15 and 0.18%. Closely followed is the under-five mortality and crude death elasticities with respect to income of between -0.10 and -0.15, and -0.06 and -0.12, respectively. This implies that a 1% increase in income will result in a fall of between 0.10 and 0.15% in under-five mortality, and between 0.06 and 0.12% fall in crude death. As in the empirical literature, the life expectancy elasticity with respect to income is relatively smaller compared to the mortality measures. The elasticity ranged between 0.01 and 0.05 that is a relatively smaller improvement in life expectancy is generated by a 1% increase in income. This is relatively lower than the range of 'elasticities' measured from cross-national data, obtained to be between -0.4 and -0.8, that is a 1% difference in income is associated with a fall of mortality of between 0.4 and 0.8%. Pritchett and Summers (1996) found long-run income elasticity of between -0.43 and -0.76 for infant mortality, under-5 mortality, and life expectancy. Also Kakwani (1993) found varying income elasticities of between -0.5 and -0.6, and Pritchett (1997) found infant mortality elasticity with respect to income of -0.59.

It is generally alluded to in the literature that the health status of any country can be affected by changes in government spending in the health sector. As reported in our results, we attempt to include three varieties of measure of public health spending as explanatory variable that explains variations in the health status. The public health expenditure is expressed as a share of total government expenditure; share of total health expenditure; and as a share of the gross domestic products. Generally, the coefficients are *a priori* signed and significantly different from zero for the three mortality measures of health status, and life expectancy.

The coefficients for the three mortality regressions are higher than for life expectancy. The more significant contribution of public health expenditure in improving infant mortality and under-five mortalities is consistent with the suggestion of some health macroeconomists (Majnoni and Ulmann 1999).The effect of the three public health expenditure measures is significantly negatively related to the three mortality variables, and significantly positively associated with life expectancy. The elasticity is however relative to other studies low for each of the mortality variables: infant mortality (-0.02 and -0.06); under-five mortality (-0.03 and -0.08); crude death rate (-0.08 and -0.21). It implies that a 1% increase in public health expenditure will cause a fall of between -0.025 and 0.08% improvement in the mortality rates. These results are similar to the result of between 0.059 and 0.080 in Berger and Messer (2002); and Hitiris and Posnett (1992). The elasticity of life expectancy with respect to public health expenditure ranges between 0.01 and 0.09, indicating between 0.01% and 0.09% increase in life expectancy in response to 1% increase in the share of public health expenditure.

As characteristic of developing countries, most SSA countries enjoy varying degree of external funding assistance in their health sector, apart from public and private domestic funding of health expenditure. As expected, *a priori*, the coefficients of the external share of funding in the SSA countries' health expenditure are negative in the three mortality regression estimates, and positive with respect to life expectancy. The elasticity of the mortality variables with respect to external share of health expenditure is highest for crude death rate, ranging from -0.13 and -0.22, and closely followed by infant mortality elasticity of between -0.13 and -0.19, the under-five mortality elasticity with respect to income of between -0.01 and -0.15 is the least of the three mortality measures. This revealed that a 1% increase in external share of health expenditure in SSA countries will result in a fall of between 0.01 and 0.22% in different mortality rates.

The age structure of the population has also been identified in the literature to affect health status. As age structure of the population changes, the healthcare demand components vary. Both the

proportion of the population aged 15 and below, and 65 and above are included in our estimates. While the proportion of the population aged 65 and below as positive impact on life expectancy, aged 15 and below negatively affect life expectancy. On the mortality measures of health status, the population aged 15 years and below variables have positive coefficients but are mostly not statistically significant in the crude death rate regressions. The variable has positive coefficients, with elasticity of between 0.28 and 0.85 in the infant mortality and under-five mortality estimates. That is a 1% increase in population aged 15 and below will aggravate occurrence of infant and under-five mortality by between 0.28% and 0.85%. This can be interpreted as reflecting increased survival rate of children. However population aged 65 years and above, though significant has negative coefficients in the infant and under-five mortality estimates.

Preventive care plays a prominent role in improving the health status of the population. To this end immunization coverage as a measure preventive care is included as explanatory variables in our regression. Based on availability of data for the SSA countries, immunization rates against DPT and measles are included. While both are statistically significant, only DPT immunization variables are consistently correctly signed *a priori.* The coefficients are negative for the three mortality regressions, while positive for life expectancy regressions. The elasticity of this preventive care activity turns to be relatively higher than with respect to even public health spending. The elasticity ranged between -0.24 and -0.52 for the three mortality regressions, being highest for crude death rate, and least for infant mortality. Specifically, the elasticities are: infant mortality (-0.24 and -0.33); under-five mortality (-0.34 and -0.40); crude death rate (-0.42 and -0.52). Thus, for a 1% increase in the DPT immunization coverage rate, a fall of between 0.24% and 0.52% in the different categories of mortality will be realized. The elasticity of DPT immunization is however expectedly lower for life expectancy, ranging between 0.02 and 0.23. This implies that between 0.02% and 0.23% improvement in the life expectancy of the SSA countries is realized with a 1% increase in DPT immunization.

One significant contradiction to *a priori* expectation of variable coefficient obtained in our estimates relates to urbanization variable. It is *a priori* expected to be negative to mortality measures of health outcomes, on the premise that inflow of population to urban centers is associated with better access to healthcare, because of the greater concentration in the urban areas relative to rural areas. With respect to the three mortality measures, the variable is correctly signed in the under-five mortality and crude death rate regressions, while statistically insignificant in the under-five mortality regression. The elasticities are: for infant mortality (between 0.01 and 0.04), for under-five mortality (between -0.0004 and -0.02), crude death rate (between -0.06 and -0.10) and life expectancy (between 0.03 and 0.05). The positive and statistically significant coefficients of urbanization variable in the infant mortality could be seen as a reflection of the resultant overstress of available health facilities in the urban area. This has implication on the quality and accessibility to mother and child care. The ability of most SSA countries to deliver the minimum maternal, new born and child health (IMNCH) package remains significantly inadequate and questionable. However, the positive implication of the urbanization variable on crude death rate and life expectancy could be viewed from possible access to improved general welfare and standard of living, which is an implication on longevity.

As in many studies in the literature, we included fertility measure as one of the explanatory variables to the variations in the health status of countries. While the coefficients of this variable are generally statistically significant, the signs are contrary *a priori*. The coefficients are positive in all the three mortality regressions and negative in the life expectancy regression. The elasticities are: for infant mortality (between 1.10 and 1.32), for under-five mortality (between 1.43 and 1.59), crude death rate (between 0.74 and 1.05) and life expectancy (between -0.14 and -0.28). This result can be interpreted in the light of increased demand for healthcare associated with higher fertility rate, especially in the face of unmatched growth in supply of healthcare service. When demand for healthcare appears to outstrip supply, the implication is reflected in poor accessibility, and corresponding

decline in health status. Of all the variables in our estimates, the fertility rate variable turns out with the highest magnitude. For a 1% increase in fertility rate, the mortality rate generally increased by between 0.74% and 1.59%, while life expectancy declined by between 0.14% and 0.28%. Thus keeping fertility low for SSA countries as a group of developing countries is what will yield improvement in the health status of these countries.

Conclusion

This paper examines the determinants of health outcomes across countries using Sub-Saharan Africa data for 45 countries from 2003-2007. The paper adopts both OLS and TSLS estimation techniques, which gives similar results. The paper utilized the log transformation of the variables to allow for elasticity interpretation of coefficients. Increases in income are associated with lower mortality in SSA countries, as are better immunization, external funding of healthcare, and fertility rate. Intensity of preventive healthcare is found to generally lower mortality and improve life expectancy. Contrary to existing results in the literature, increases in fertility rates in SSA countries result in higher mortality rates, implying increased pressure on health facilities. Similarly, urbanization rate appears to be associated with higher mortality, suggestive of increased demand for healthcare in the face of unmatched increase in supply of healthcare delivery.

Finally, public financing of healthcare expenditures is negatively related with the three mortality rates (infant, under-five mortalities, and death crude rate), and positively related with life expectancy. This is true for the various measures of public expenditure on health, in the alternative estimation techniques. It is found that increases in the publicly financed share of healthcare expenditures are associated with lower mortality rates and higher life expectancy. Thus, not only does the level of healthcare expenditures matter in determining mortality rates, but so does the mix of expenditures, as indicated by the share of public expenditure on health. One potential implication of the findings is that as countries increase the level of their health expenditures, they may want to avoid increasing the proportion of their expenditures that are publicly financed.

Gerdtham, U.G., B. Jonsson (2000) "International comparisons of health expenditure: theory, data, and econometric analysis", *Handbook of Health Economics*, A. J. Culyer, J.P. Newhouse, [eds.], Volume 1A, North Holland Publishing, Elsevier Science, Amsterdam.

Gianonni, M. and T. Hittris (2002) "The regional impact of healthcare expenditure: the case of Italy". *Applied Economics* 34(14): pp. 1829 – 1836.

Grossman, M. (1972) "On the concept of health capital and the demand for health", *Journal of Political Econ*, 80, pp. 223–255.

Grossman, M. (2000) "The human capital model. In: Culyer A.J., New House J.P. (ed) *Hand Book of Health Economics*, Vol. 1A. Elsevier: Amsterdam.

Gravelle, H., and M.E. Backhouse (1987) "International cross-sectional analysis of the determination of mortality" *Social Science & Medicine* 25(5): pp. 427-441.

Gupta, S., M. Verhoeven, and E. Tiongson (1999) "Does government spending buy better results in education and healthcare?", *IMF Working Paper* No.WP/99/21. International Monetary Fund, Washington, D.C.

Gupta, S., M. Verhoeven, and E. Tiongson (2001) "Public spending on healthcare and the poor", *IMF Working Paper No.* WP/01/127, International Monetary Fund: Washington, D.C.

Gupta, I. and A. Mitra (2004) "Economic growth, health and poverty: an exploratory chapter for India", *Development Policy Review*, 22 (2), pp. 193-206.

Gwatkin, D.R. (2000) "Health inequalities and the health for the poor: what do we know? What can we do?" *Bulletin of the World Health Organization*, 78 (1), pp. 3-18.

Hitris, T. and J. Nixon (2001) "Convergence of healthcare expenditure in the EU Countries", *Applied Economics Letters* 8(4): 223-228.

Hitiris, T. and J. Possnett (1992) "The Determinants and Effects of Health Expenditure in Developed Countries" *Journal of Health Econ* 6, pp. 173–181.

Hojman, D.E. (1996) Economic and other determinants of infant and child mortality in small developing countries: the case of Central America and the Caribbean", *Applied Economics,* 28, pp. 281-90.

Jones, G., R. Steketee, Z. Bhutta, S. Morris, and the Bellagio Child Survival Chapter Group (2003) "How many child deaths can we prevent this year?" *The Lancet*, 362, pp. 65-71.

Judge, K., J.A. Mulligan, and M. Benzeval (1998) "Income inequality and population health", *Social* Science and Medicine, 46, pp. 567-79.

Kakwani, N. (1993) "Performance in living standards: an inter-national comparison". *Journal of Development Economics*, 41, pp. 307-336.

LeGrand, J. (1987) "Inequalities in Health: Some International Comparisons, *European Economic Review*, 31, pp. 182-91.

Majnoni d'Intignano B. and P. Ulmann (1999) "The qualitative performance of the French healthcare system: evolutions compared to Europe since 1970. *Health Science System* 3, pp. 123–141.

Makinen, M. and **Others** (2000) "Inequalities in healthcare use and expenditures: empirical data from eight developing countries and countries in transition" *Bulletin of the World Health Organization*, 78(1), pp. 55-65.

Martin S., Nigel Rice and Peter C. Smith (2008) "Does healthcare spending improve health outcomes? Evidence from English programme budgeting data", *Journal of Health Economics* 27 pp. 826–842.

Musgrove, P. (1996) "Public and Private Roles in Health: Theory and Financing Patterns" *World Bank Discussion Paper* No. 339. Washington, DC.

Nixon, J. and P. Ulmann (2006) "The relationship between healthcare expenditure and health outcomes", *European Journal of Health Economics* 7, pp. 7–18.

Nixon, J., and P. Ulmann (2006) "The relationship between healthcare expenditure and health outcomes." *European Journal of Health Economics* 7: pp. 7-18.

OECD (1995) "New Directions in Healthcare Policy", *Health Policy Studies* 7, Paris.

Smith, D. G. (1996) "Income Inequality and Mortality: Why are they related?" *British Medical Journal*, 312, pp. 987-8.

Pritchett, L. and L. Summers (1996) "Wealthier is Healthier", *Journal of Human Resources* 31(4), pp. 841-868.

Pritchett, L. (1997) "Divergence, big time", *Journal of Economic Perspectives* 11, pp. 3-7.

Sen, A. (1998) "Mortality as an indicator of economic success and failure", *Economic Journal*, 108, pp. 1-25.

Smith, D. G. (1996) "Income inequality and mortality: Why are they related?" *British Medical Journal*, 312, pp. 987-8.

Srinivasan, T. N. (1994) "Data base for development analysis: An overview" *Journal of Development Economics* 44, pp. 3-27.

Strauss, J., Thomas, D. (1995) Human Resources: Empirical Modeling of Household and Family Decisions. In: Behrman, J., Srinivasan, T.N. (Eds.), *Handbook of Development Economics*, vol. 3. North Holland Press, Amsterdam, pp. 1883-2023.

Wagstaff, A. (2000) "Socioeconomic inequalities in child mortality: comparisons across nine developing countries", *Bulletin of the World Health Organization*, 78 (1), pp. 19-29.

WDI (2010) "World Development Indictor", World Bank, 2010 Edition.

Wilkinson, R. G. (1992) "Income Distribution and Life Expectancy, *British Medical Journal*, 304, pp. 165-8.

Wolfe, B. L. (1986) "Health Status and Medical Expenditures: Is there a Link?" *Social Science and Medicine*, 22, pp. 993-99.

World Bank (1995) "Philippines: Public expenditure management for sustained and equitable growth", *World Bank Report No.* 14680-PH (Washington: World Bank).

Appendix A: Definition of Regression Variable

Variable	Definition	Source of data
LIFM	Log of the number of infants dying before reaching the age of 1 year, per 1000 live births in a given year	World Development Indicators
LU5M	Log of the probability that a newborn child will die before reaching the age of 5 expressed as a rate per 100 children under age five	World Development Indicators
LCDR	Log of the number of deaths occurring during the year per 1000 population estimates at mid-year	World Development Indicators
LLE	Log of the probability of surviving to a particular age at birth in a population at a given year.	World Development Indicators
LRGDPPC	Log of the real gross domestic product per capita (in the US$ constant prices)	World Development Indicators
LHEPGE	Log of the proportion of public health expenditure (recurrent and capital) in total government budgets expenditure.	World Development Indicators
LHEPTHE	Log of the proportion of public health expenditure (recurrent and capital) in total health expenditure	World Development Indicators
LHEPGDP	Log of the proportion of public health expenditure (recurrent and capital) to Gross Domestic Product	World Development Indicators
LIMMEAS	Log of the percentage of children aged 12-23 months who received one dose of vaccine against measles before 12 months	World Development Indicators
LIMDPT	Log of the percentage of children aged 12-23 months who received one dose of vaccine against DPT before 12 months	World Development Indicators
LURBPT	Log of the estimated urban population as proportion of total population	World Development Indicators
LP15	Log of the proportion of the total population that is aged 15 and below	World Development Indicators
LP65	Log of the proportion of the total population that is aged 65 and above	World Development Indicators
LEXFH	log of the external fund on health as percentage of total health expenditure	World Development Indicators
LFR	Log of the fertility rates	World Development Indicators

Appendix B: Table B-1: Two Stage Least Square and Fixed Effect Estimates for Under-five and Infant Mortality Regressions

	2STLS			Fixed Effect			2STLS			Fixed Effect		
	LU5M			LU5M			LIFM			LIFM		
Constant	3.23** (2.21)	1.73 (1.14)	1.86 (1.48)	2.37 (1.58)	0.98 (0.65)	1.19 (0.92)	3.49*** (5.00)	3.59*** (5.18)	2.50*** (2.98)	3.80 (1.46)	4.08* (1.64)	2.90 (1.26)
LEXFH	0.001*** (-3.18)	-0.15*** (-4.92)	-0.13*** (-3.81)	-0.10*** (-3.32)	-0.13*** (-4.65)	-0.11*** (-3.72)	-0.17*** (-6.71)	-0.17*** (-5.94)	-0.19*** (-7.92)	-0.13*** (-16.37)	-0.13*** (-12.99)	-0.15*** (-17.97)
LGDPPC	-0.10*** (-7.17)	-0.15*** (-14.22)	-0.12*** (-8.68)	-0.10*** (-5.69)	-0.13*** (-10.03)	-0.11*** (-6.50)	-0.17*** (-13.19)	0.16*** (-10.21)	-0.18*** (-16.24)	-0.16*** (-13.26)	-0.15*** (-12.29)	-0.17*** (-12.03)
LP15	0.39 (1.27)	0.66*** (2.04)	0.66*** (2.61)	0.59* (1.92)	0.85*** (2.70)	0.82*** (3.10)	0.37*** (3.10)	0.36*** (2.97)	0.57*** (3.97)	0.33 (0.60)	0.28 (0.54)	0.51 (1.05)
LP65	-0.32*** (-3.91)	-0.29*** (-3.43)	-0.30*** (-3.88)	-0.26*** (-4.20)	-0.06*** (-3.66)	-0.25*** (-4.24)	-0.04* (-1.78)	-0.05*** (-2.29)	-0.01 (-0.28)	0.03 (-0.76)	-0.06* (-1.79)	-0.01 (-0.53)
LHEPGE	-0.07*** (-4.41)			-0.07*** (-4.07)			-0.03*** (-23.31)			-0.06*** (-20.81)		
LHEPTHE		0.08*** (10.37)			0.06*** (3.76)			-0.04*** (-5.16)			-0.06*** (-19.90)	
LHELGDP			0.04** (2.06)			0.03 (1.50)			-0.05*** (6.13)			0.02 (1.03)
LIMDPT	-0.40*** (-4.40)	-0.40*** (-3.90)	-0.40*** (-4.13)	-0.35*** (-18.13)	-0.34*** (-13.47)	-0.35*** (-14.41)	-0.24*** (-33.49)	-0.24*** (-48.00)	-0.22*** (-175.48)	-0.33*** (-12.53)	-0.33*** (-12.43)	-0.31*** (-12.99)
LIMMEAS	0.21 (1.50)	0.24 (1.57)	0.22 (1.55)	0.14*** (3.26)	0.14*** (2.78)	0.13*** (2.80)	0.004 (0.33)	-0.003 (-0.22)	-0.03*** (-4.71)	0.06*** (2.52)	0.06* (1.93)	0.03 (1.50)
LURBR	-0.02** (-2.00)	-0.003 (-0.28)	-0.005 (-0.40)	-0.01 (-1.28)	-0.0004 (-0.03)	-0.001 (-0.08)	0.01* (1.80)	0.01* (1.76)	0.02*** (2.84)	0.03*** (4.07)	0.03*** (3.88)	0.04*** (3.06)
LFR	1.43*** (11.59)	1.54*** (11.55)	1.54*** (14.93)	1.50*** (16.07)	1.59*** (15.97)	1.58*** (23.63)	1.23*** (31.96)	1.22*** (34.01)	1.32*** (22.24)	1.12*** (5.99)	1.10*** (6.11)	1.19*** (7.76)
R-Square	0.83	0.83	0.83	0.83	0.83	0.83	0.75	0.75	0.75	0.73	0.73	0.72
Adj. R-Square	0.82	0.82	0.82	0.82	0.82	0.82	0.71	0.71	0.71	0.70	0.70	0.70
No. of Obs.	174	174	174	218	218	218	86	86	86	130	130	130
Cross-section included	44	44	44	44	44	44	43	43	43	44	44	44
F-Statistics	68.02	68.14	67.39	78.77	78.14	77.61	23.55	23.59	23.64	28.38	28.29	28.00

Note: T-statistics are in parenthesis, "*", "**", and "***" signifies the level of significance at 10%, 5%, and 1%, respectively.

Table B-2: Two Stage Least Square and Fixed Effect Estimates for Life Expectancy and Crude Death Rate Regressions

	2STLS			Fixed Effect			2STLS			Fixed Effect		
	LLE			LLE			CDR			CDR		
Constant	2.83*** (6.56)	2.90*** (5.96)	3.70*** (8.66)	2.76*** (5.64)	2.91*** (5.81)	3.52*** (9.2)	1.23 (1.32)	1.48 (1.35)	-0.85 (-1.09)	1.13 (1.17)	1.13 (1.14)	-0.56 (-0.82)
LEXFH	0.07*** (7.29)	0.08*** (6.67)	0.08*** (8.75)	0.04*** (6.70)	0.05*** (6.08)	0.05*** (8.47)	-0.20*** (-10.40)	-0.22*** (-7.94)	-0.21*** (-11.21)	-0.13*** (-9.69)	-0.14*** (-7.45)	-0.15*** (-10.81)
LGDPPGR	0.03*** (2.53)	0.05*** (3.09)	0.03*** (3.09)	0.01** (2.14)	0.02*** (2.60)	0.02*** (3.13)	-0.08*** (-4.15)	-0.12*** (-3.59)	-0.09*** (-4.24)	-0.04*** (-3.53)	-0.06*** (-3.01)	0.06*** (-4.41)
LP15	0.37*** (4.67)	0.36*** (3.96)	0.16*** (2.20)	0.35*** (3.24)	0.32*** (2.94)	0.17*** (2.16)	-0.04 (-0.19)	0.001 (0.003)	0.54*** (3.61)	0.14 (0.66)	0.14 (0.65)	0.54*** (3.36)
LP65	0.05*** (3.53)	0.03*** (2.77)	0.02 (0.80)	0.03*** (2.71)	0.02 (1.60)	-0.01 (0.44)	-0.02 (-0.45)	0.04 (1.03)	0.08 (1.30)	0.04 (0.97)	0.07*** (2.34)	0.11*** (2.71)
LHEPGE	-0.04*** (-5.54)			-0.02*** (-5.54)			0.13*** (10.17)			0.08*** (10.37)		
LHEPTHE		-0.06*** (5.88)			-0.01*** (-5.10)			0.15*** (4.79)			0.08*** (3.66)	
LHELGDP			-0.09*** (-17.60)			-0.07*** (-10.51)			0.21*** (15.64)			0.16*** (10.80)
LIMDPT	0.02*** (7.53)	0.23*** (7.32)	0.23*** (7.02)	0.20*** (16.08)	0.19*** (16.93)	0.18*** (16.12)	-0.55*** (-9.45)	-0.52*** (-9.88)	-0.52*** (-8.66)	-0.45*** (-20.71)	-0.44*** (-19.97)	-0.42*** (-24.14)
LIMMEAS	-0.38*** (-8.33)	-0.36*** (-8.61)	-0.33*** (--7.38)	-0.27*** (-14.02)	-0.26*** (-17.33)	-0.23*** (-12.68)	0.79*** (8.78)	0.74*** (9.80)	0.67*** (7.56)	0.55*** (17.56)	0.53*** (27.16)	0.46*** (18.03)
LURBR	0.05*** (10.57)	0.05*** (12.76)	0.03*** (12.15)	0.04*** (8.55)	0.04*** (8.63)	0.03*** (6.63)	-0.10*** (-16.26)	-0.10*** (-11.74)	-0.07*** (-9.62)	-0.09*** (-13.45)	-0.88*** (-11.75)	-0.06*** (-7.74)
LFR	-0.17*** (-3.49)	-0.19*** (-3.59)	-0.28*** (-5.76)	-0.14*** (-4.34)	-0.16*** (-4.64)	-0.23*** (-10.58)	0.80*** (11.01)	0.82*** (10.71)	1.05*** (15.35)	0.74*** (14.90)	0.75*** (14.87)	0.93*** (62.00)
R-Square	0.28	0.29	0.34	0.29	0.30	0.35	0.40	0.40	0.45	0.40	0.40	0.45
Adjusted R-Square	0.23	0.23	0.29	0.25	0.25	0.31	0.36	0.36	0.41	0.37	0.36	0.42
No. of Observations	172	172	172	216	216	216	174	174	174	218	218	218
Cross-section included	44	44	44	44	44	44	44	44	44	44	44	44
F-Statistics	6.89	7.24	9.20	6.47	6.65	8.35	11.68	11.58	14.60	10.66	10.57	12.91

Note: T-statistics are in parenthesis, "*", "**", and "***" signifies the level of significance at 10%, 5%, and 1%, respect