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THE EFFECT OF HEALTHCARE EXPENDITURE ON COUNTRIES' HEALTH SYSTEM PERFORMANCE: THE CASE OF 46 COUNTRIES IN AFRICA

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Abstract

Healthcare financing is one of the tools used by policy makers to improve health system performance. Several studies have examined the influence of healthcare expenditure on health outcomes with contradictory results. This study sets out to determine the influence of health care expenditure on health system performance in 46 African countries for the years 2018-2020. For this, secondary data was collected from the World Bank's data base. Out of the 54 countries 8 countries were dropped due to missing data sets and only countries with a complete data set for all variables included in the study were used. The random effects generalized least squares estimation regression model was used to examine the relationship effect of Health care expenditures on health system performance using life expectancy as a proxy for health system performance. Control variables included in the model were GDP per capita, out of pocket expenditure and country population. Findings revealed the existence of a negative statistically insignificant effect of health expenditure on life expectancy. GDP per capita was found to have a positive and statistically significant effect on life expectancy. Both out of pocket expenditure and population were found to also have a negative effect on life expectancy. The study concluded that increase health financing does not strengthen health system if not backed proper accountability system. It thus recommends that increased government expenditure on health care should be accompanied by proper financial management systems and the demand for accountability in the use of healthcare resources to better strengthen the health system.

Keywords: Health expenditure, Health system performance, Life expectancy, Out-of-pocket Expenditure

INTRODUCTION

The objective of a health system and its policy makers is to improve the health of the population. This can be achieved through the efficient and equitable delivery of health services. The effect of an intervention, policy or process change aimed at improving population health, can only be quantified through an evaluation of its effect on health system performance (WHO, 2010). Such actions usually target one or more of the health systems building blocks which are financing, personnel, health information systems, leadership and governance, access to essential medicines and service delivery. However, the absence/incompleteness of data on health system input and outcome indicators, especially in LMICs, makes it difficult to monitor how the health system responds to interventions or policies aimed at improving health (WHO 2010).

Several studies have associated a country's health expenditure to its GDP. Countries with higher GDP, have more financial resources at their disposal hence dedicate more

resources to the health sector (Amponsah, 2019). These studies explain that an increase in health expenditure, results to an improvement of health infrastructure and service delivery, and thus better health outcomes for the population. This will probably explain why the percentage of GDP spent on health is usually higher for HMICs (High- and Middle-Income Countries) than it is for Low Income Countries (WHO, 2021). A report by the WHO, revealed health expenditure per capita to be 3191 dollars for HICs (High Income Countries) and 39 dollars for LICs (Low Income Countries). Although health spending for HMICs has grown over the past two decades, health spending in LICs has decreased over the same period (WHO, 2021). Donor funding was expected to supplement public spending in LIC. Conversely, LICs have restricted public spending, stagnating at 5% of GDP and rely heavily on external aid and out of pocket spending for healthcare (WHO 2021). This is not the case with HICs where the proportion of out of pocket health expenditure has decreased over the past 2 decades.

Similarly, a study by Amponsah, (2019), revealed that the average health expenditure for 42 out of 48 countries in Sub Saharan Africa (SSA), was 6.75% of GDP. Countries in Central Africa were found to have even lower percentages which ranged from 2.6 to 3.9% of GDP. It should also be noted that the 3 countries which reported much higher percentages, ranging from 9.3 -16.3 % of GDP were countries with ongoing reconstruction from civil unrest, with a large proportion of their health income being donor funding for the reconstruction of the health system. Conversely HMICs report higher budgetary allocation rates for health care. In 2021, Portugal, Canada and Sweden allocated more than 10% of GDP to healthcare whereas USA allocated an outstanding 18% of GDP to the health sector (WHO, 2021).

Given the disparity in healthcare spending between HMICs and LMICs, it is as expected that health outcomes are better in HMICs than in LMICs since studies have revealed a significant positive association between health expenditure and health outcome (Onofrei et al., 2021); (Schneider et al 2021). However, other studies have revealed no relationship or a negative association between health expenditure and health outcomes (Hlafa et al., 2019; Oladosu et al., 2022). This work thus set out to investigate the Africa situation by seeking to determine the effect of government's health expenditure on life expectancy and to investigate the influence of out-of-pocket expenditure on life expectancy.

LITERATURE REVIEW

Many studies have investigated the influence of health expenditure on health outcomes such as life expectancy, under 5 mortality and maternal mortality, just to name a few. Studies in high income countries often yield results which show a positive effect of health expenditure on health outcomes. Amongst them is that of Onofrei et al (2021), who conducted a study to

determine the influence of public health expenditure on health outcomes in developing countries of the European Union where regression and factor analysis were used to analyse data. Results showed that increased health expenditure led to improved health outcomes for indicators such as life expectancy and infant mortality. Similar results were obtained in a study involving members of the Organization for Economic Cooperation and Development. Using panel data for 38 OECD countries from 1996 to 2020, Anwar et al (2023) examined the relationship between health expenditure and health outcomes. The results showed government health expenditure having a significant positive effect on life expectancy and a significant negative effect (reduce) on infant mortality. Income, and number of doctors were found to have a negative effect on infant mortality rates. The study explains that a higher GDP per capita and higher income level meant more resources were available for government and individuals to spend on healthcare thus, improving health status. Likewise, using World bank data for the years 2000 to 2015, Rezapour et al (2019), investigated the relationship between public and private health expenditure and health outcomes for middle- and high-income countries. The countries were classified into 3, based on the level of health expenditure. Group 1 at 2.21%, group 2 at 4.40% and group 3 at 7.02%. In all 3 groups, public health expenditure was found to have a significant positive effect on life expectancy, infant and under 5 mortality, leading to an improvement of health status. Conversely, private health expenditure in group 1, had a significant negative effect on infant mortality rate only; in group 2 a significantly positive effect on life expectancy and infant mortality rate; and in group 3 a significantly positive effect on under 5 mortality rate. Thus public health expenditure was found to have a higher influence on health status than private health expenditure.

A study by Rahman et al (2018), investigated the relationship between health expenditure and health outcomes such as infant mortality rate, life expectancy at birth and crude death rate. Health expenditure was captured as the percentage of GDP dedicated to healthcare, and in three forms: public, private and total. The study involved 20 countries of the SAARC (South Asian Association for Regional Cooperation) and ASEAN (Association for South East Asian Nations), and analyzed data from 1995 to 2014. The study revealed that total, private and public health expenditure had no impact on life expectancy at birth. This is explained by the existence of other factors, such as diet and lifestyle which influence life expectancy, but are not related to the healthcare system. However GDP per capita was found to have a positive association with life expectancy.

Contradicting results are obtained for studies on lower middle income and low-income countries. In some cases, health expenditure has a positive effect on health outcomes, while in other studies the effect is negative. These results are different as other aspects of the health

system such as resource management come into play. A study by Schneider et al (2021), sought to investigate the effect of primary health care expenditure (PHC) on health outcomes for LMICs, using data from 2000-2017. It revealed that primary health expenditures had risen over the past 17 years from 41 to 90 dollars per capita, but had plateaued since 2014 for low-income countries, remaining at 17 dollars per capita. Although PHC expenditures decreased with increasing national income, the proportion of PHC expenditures dedicated to primary healthcare continued to grow. Data analysis revealed that increasing the proportion of healthcare expenditure channeled towards primary healthcare, led to a decrease in maternal mortality, increase in the quality of health care and access to healthcare, and improved coverage for measles vaccination and antenatal clinics, but did not reduce the burden of Non-Communicable Diseases (NCDs). Furthermore, Chireshe et al. (2020) evaluated the effect of healthcare expenditure on health outcomes in Sub Saharan countries. The study involved 45 countries and used data from 1995 to 2018. Health outcomes were captured as under 5 mortality rate and life expectancy. Healthcare expenditure was captured as total health expenditure per capita, public healthcare expenditure to GDP, and private healthcare expenditure to total health expenditure. Total healthcare expenditure per capita and public health expenditure to GDP showed a negative association with under 5 mortalities. Meanwhile total health expenditure showed a positive relationship with life expectancy.

In addition, Bein et al (2017), examined the relationship between healthcare expenditure and health systems outcomes like life expectancy, infant, neonatal and under 5 mortalities, in 8 East African countries. Data on development indicators from 2000 to 2014, was analyzed using the regression technique. The findings showed a positive influence of public health expenditure on life expectancy. Furthermore, a stronger correlation was observed between public health expenditure and female life expectancy than that for male life expectancy.

Some studies have evaluated the relationship between health expenditure and health outcomes at country level, revealing contradicting results on the effect of health expenditure on health outcome. Hlafa et al (2019), investigated the effect of public health expenditures on health outcomes in South Africa, using data from 2002 to 2016. Panel data analysis was done using 3 regression techniques: fixed effects, random effects and pooled OLS. In some provinces, a positive significant effect of public health expenditure on and both life expectancy and under 5 mortality was revealed. Conversely some provinces showed a negative and insignificant effect of public health expenditure on under 5 mortality and life expectancy at birth.

Oladosu et al. (2022), also investigated the relationship between health expenditure and health outcome indicators such as infant, maternal, malaria and HIV/AIDS mortality in Ghana and Nigeria. Through a regression analysis, they also investigated the influence of public health

policy on this relationship, taking into consideration the UN's MDGs now SDGs and the Abuja Declaration of 2001. Annual time series data from 2000 to 2018 was collected from the World Bank's data base. Both countries bear a heavy burden of malaria and HIV/AIDS, and despite high government revenues and economic growth, Ghana's healthcare expenditure has risen by only 0.48% from 2000 to 2015 while Nigeria still accounts for 25% of the global malaria burden. Analysis of the simulation revealed that public health expenditure improved all health indicators in Ghana, although not all were significant. However, in Nigeria, public health expenditure had a positive relationship with all indicators, meaning increasing public health expenditure led to an increase in mortality rates.

STUDY FRAMEWORK

The framework in figure 1 is adapted from WHO, (2015) and illustrates how increasing health expenditure results to an increase in health outcomes. An increase in financial resources could lead to an increase in health system inputs such as: the recruitment of more health personnel, construction of new health facilities, purchasing of new equipment and drugs and investment in universal health coverage (UHC). All of these go a long way to increase access to health services and the quality of health services, and eventually an increase in the health status and life expectancy of the population.

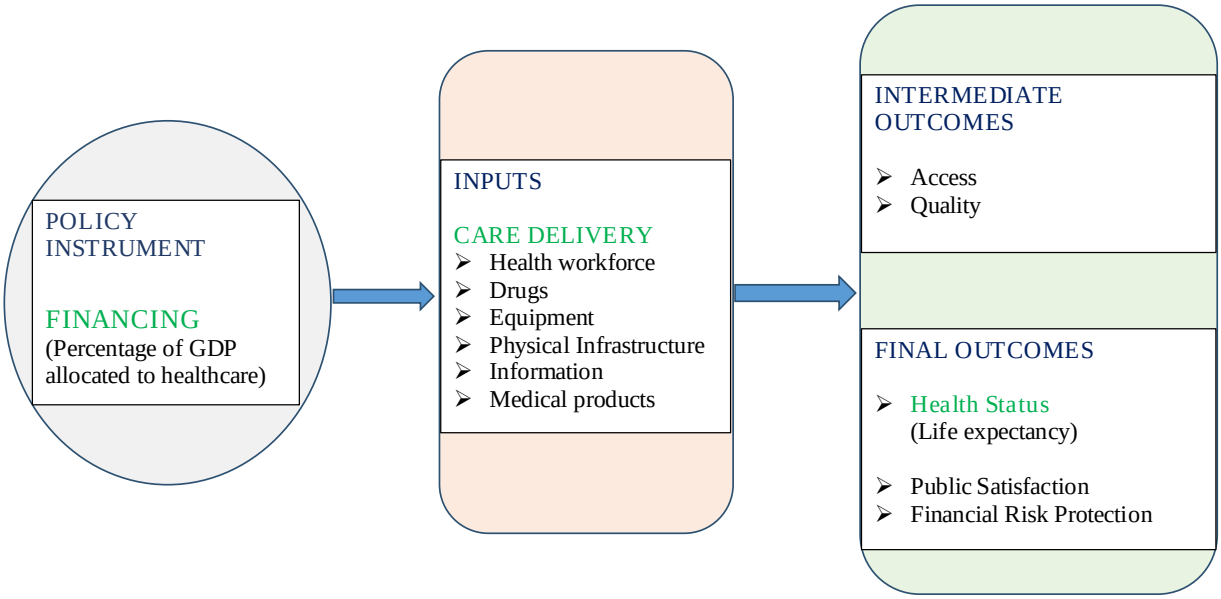

Figure 1: Health financing and health system performance framework

Source: Adapted from WHO (2015)

METHODOLOGY

For this descriptive study, the table 1 below specifies the research variables and their measurement.

Table 1: Description and measurement of variables

Variables	Description	Measurement
Life expectancy	The average period that a person may expect to live.	The Average years lived by persons in a particular country.
Government health expenditure	How much a country spends on health as a percentage of GDP.	Percentage of GDP dedicated to health expenditure.
GDP per Capita	It is the financial value of the total goods and services, or expenditures or income in a country in a year.	GDP.
Population	The total number of people living in a country.	Population of a country
Out of pocket expenditure	It is any direct spending by individuals or households, including cash, gratuities and in-kind payments to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services whose primary intent is to contribute to the restoration or enhancement of the health status of individuals or Households.	Out of pocket expenditure in US Dollars.

Source: Authors' compilation

Model Specification

The study uses the panel ex-post facto research methodology, which is a causal-comparative alternative method for determining linkages between events and circumstances. Panel design is a type of longitudinal study which permits a researcher to sample a group (or panel) of participants and then measure some variables of interest within the group at different points in time. The study makes use of panel data collected from 46 African countries out of 54 for a period of 3 years from 2018-2020. This time was period was chosen because of the availability of most recent data set and the onset of the COVID-19 pandemic. This study is limited to these countries due to lack of data in the other 8 African countries. It allows for a more precise inference of model parameters since they typically have more degrees of freedom and sample heterogeneity, which increases the effectiveness of econometric estimations (Hsiao et al., 1995). Also the use of panel data enables the development of forecasts for individual outcomes that are more accurate since the data is pooled rather than predictions for individual outcomes that are generated using the data on the individual entities (Hsiao, 2007).

The empirical model used to assess the effect of Healthcare Expenditure on Countries' Health System Performance is specified as follows;

Life Expectancy = f (government health expenditure, GDP, population, out of pocket expenditure)……..……..(1)

The econometrics model is as follows;

$$LE_{it} = a_0 + a_1GHE_{it} + a_2LogGDP_{it} + a_3LogPop_{it} + a_4OUTEC_{it} + \varepsilon_{it} \quad .....(2)$$

With aprori expectation

$\alpha_1 > 0$, $\alpha_2 > 0$, $\alpha_3 > 0$, $\alpha_4 > 0$

Where:

- **LE = life expectancy**
- $a_{0=}$ Value of life expectancy (dependent variable) when the independent variables are held constant
- $_{it}$ individual values from different countries over time
- a_1 , a_2 , a_3 , $a_{4=}$ the Regression coefficients for government health expenditure, GDP, population, out of pocket expenditure respectively
- **GHE** is government health expenditure
- **GDP** is Gross Domestic Product
- **Pop** is the total population per country
- **OPEC** is out of pocket expenditure
- **ε** the random error term

RESULTS AND DISCUSSION

Table 2: Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
le	overall	63.95298	5.815225	52.554	77.23659	N = 132
	Between		5.724735	52.78367	75.745	n = 46
	within		0.426004	62.08631	66.48144	T-bar = 2.86957
ghe	overall	5.194917	2.10418	1.901432	11.78429	N = 131
	Between		2.058189	2.095841	11.40352	n = 46
	within		0.374906	4.118155	6.684344	T-bar = 2.84783
gdppc	overall	3601.717	7235.857	48.10262	47544.98	N = 132
	Between		7137.589	50.94527	46568.2	n = 46
	within		473.0409	528.2014	5359.299	T-bar = 2.86957

pop	overall	5.16E+07	1.80E+08	96762	1.23E+09	N = 132
	Between		1.77E+08	97616.33	1.20E+09	n = 46
	within		2543547	3.75E+07	7.37E+07	T-bar = 2.86957
opec	overall	43.39789	54.70758	3.415797	309.819	N = 132
	Between		53.36749	3.713127	282.8283	n = 46
	within		9.116387	-17.9588	77.56066	T-bar = 2.86957

Source: Computed by the Authors by use of Stata 14

Table 2 presents a description of the basic features of the data set in the study. On this table we have simple summaries of the data under observation. We can see that the number of observations or data points (N) is 132, extracted from 46 African countries (n). We used random effect that is the within (all information are used for one individual) and between (across groups) effect. We are interested in the average that is the overall effect. The mean life expectancy is 63 years in the selected African countries with a minimum of 52 years and maximum of 77 years. The government health expenditure has an average of 5.1% and minimum value of 1.9% while maximum value is 11%. Also, the variable GDP per capita recorded an average value of 3601 us dollars and a minimum value of 48 us dollars and maximum value of 47544 us dollars. Lastly, the out-of-pocket variable recorded a mean value of 43 and minimum and maximum values of 3.4 and 309 respectively.

The results of the Hausman test (see appendix) is seen to be significant with the probability level below 5%(0.05), the rule of thumb is to use the fixed effect model, but due to the fact that the fixed effect model is insignificant, we make use of the random effect generalized least squares estimation results for both models.

Table 4: Random Effects General Least Squares model

	Coef.	**Std. Err.**	**Z**	**P>|z|**
ghe	-0.029	0.1216	-0.24	0.810
Lgdppc	0.914	0.4878	1.88	0.061
Lpop	-1.342	0.531	-2.53	0.011
opec	-0.0185	0.0053	-3.51	0.000
cons	65.35	10.24	6.38	0.000
Pob > chi2	0.0044			
Sigma_u	5.195			
Sigma_e	0.4837			
Rho	0.9914			

Source: Computed by the Authors by use of Stata 14

Results on table 4 show that the Prob > chi2 is 0.0044 which is less than 1%, this implies the life expectancy in the model is statistically significant globally at 1% level of significance, our model is well specified. Government health expenditure (ghe) has a negative coefficient of -0.029. This implies a 1% increase in ghe will lead to a decrease of life expectancy by 0.029% though statistically insignificant. This is contrary to the work of Chireshe et al (2020) who evaluated the effect of healthcare expenditure on health outcomes in Sub Saharan countries, with results that showed a positive effect of total health expenditure on life expectancy. Some researchers have blamed this negative effect on corruption and low flow of the budget to the population, due to extreme centralization of health services in Africa. Proponents have argued that proper management and accountability in the management of health resources will better strengthen the health system than increased financing. For GDP per capita (gdppc), the coefficient is positive (0.914) which implies a 1% increase in gdppc will lead to an increase in life expectancy by 0.914% and it is statistically significant at 5% level. This is in line with the work of Bayar et al (2021) and Anwar et al (2023) where gdppc had a positive impact on life expectancy. Furthermore, the population (pop) and out of pocket expenditure (opec) have negative coefficients of -1.342 and -0.0185 respectively, and statistically significant at 1%. This implies a 1% increase in pop and opec will lead to a decline in life expectancy by -1.34% and -0.0185% correspondingly.

CONCLUSION AND POLICY IMPLICATIONS

Drawing from the results, it can be concluded that, life expectancy has a negative and statistically insignificant effect on government health expenditure. This suggests that increasing healthcare financing alone does not lead to an increase in health outcomes. The study has some limitations amongst which is its failure to take into account donor expenditure, which is a huge source of funding in LMICs. Furthermore, the use of only African countries limits the findings to the African context, Cameroon inclusive. The study's inclusion of Out of pocket expenditure and population were shown to have a negative and statistically significant effect on life expectancy. This implies that as population and out of pocket expenditure increase, life expectancy decreases. This could be explained by the fact that with an increase in the population, scarce resources are stretched and cannot fully cater for everyone's health needs. Furthermore, an increasing dependence on out-of-pocket health expenditure makes it difficult for individuals of low income to afford healthcare. Given the negative relationship between government health expenditure and life expectancy, the study recommends that increase in health expenditure should be accompanied by proper financial and health system management. There is a need for accountability in the use of health care funds to positively influence health

outcomes, as has been observed in high income countries which already have these systems in place. Furthermore, increasing out-of-pocket expenditure was shown to accompany decreasing life expectancy. Thus, there is a need for prepay mechanisms which have been shown to reduce the financial burden of healthcare.

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APPENDIX

Hausman results

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hausman fe re, sigmamore
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	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ghe	-.0924107	-.029244	-.0631666	.0509125
lgdp	.6109861	.9144395	-.3034534	.517107
lpop	-2.284807	-1.342125	-.9426822	2.369458
opec	-.0237789	-.0185063	-.0052726	.002616

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 15.63
Prob>chi2 = 0.0036

```
. xtreg le ghe lgdp lpop opec, fe

Fixed-effects (within) regression               Number of obs      =       131
Group variable: id                              Number of groups   =        46

R-sq:  within  = 0.2027                         Obs per group: min =         1
       between = 0.0101                                        avg =       2.8
       overall = 0.0122                                        max =         3

                                                F(4,81)            =      5.15
corr(u_i, Xb)  = -0.4287                        Prob > F           =    0.0010

------------------------------------------------------------------------------
          le |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ghe |  -.0924107   .1254366    -0.74   0.463    -.3419901    .1571688
        lgdp |   .6109861   .6759874     0.90   0.369    -.7340168    1.955989
        lpop |  -2.284807     2.3095    -0.99   0.325    -6.879987    2.310373
        opec |  -.0237789   .0055939    -4.25   0.000    -.0349091   -.0126487
       _cons |   88.17853   41.03923     2.15   0.035     6.523337    169.8337
-------------+----------------------------------------------------------------
     sigma_u |  6.3316546
     sigma_e |  .48373616
         rho |  .99419697   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(45, 81) =    312.35                 Prob > F = 0.0000

. xtreg le ghe lgdp lpop opec, re

Random-effects GLS regression                   Number of obs      =       131
Group variable: id                              Number of groups   =        46

R-sq:  within  = 0.1931                         Obs per group: min =         1
       between = 0.0106                                        avg =       2.8
       overall = 0.0127                                        max =         3

                                                Wald chi2(4)       =     15.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0044

------------------------------------------------------------------------------
          le |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ghe |   -.029244    .121659    -0.24   0.810    -.2676912    .2092032
        lgdp |   .9144395   .4875758     1.88   0.061    -.0411914     1.87007
        lpop |  -1.342125   .5307776    -2.53   0.011     -2.38243   -.3018196
        opec |  -.0185063   .0052676    -3.51   0.000    -.0288305    -.008182
       _cons |   65.35462   10.23874     6.38   0.000     45.28707    85.42218
-------------+----------------------------------------------------------------
     sigma_u |  5.1958505
     sigma_e |  .48373616
         rho |  .99140678   (fraction of variance due to u_i)
------------------------------------------------------------------------------
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hausman fe re, sigmamore
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	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ghe	-.0924107	-.029244	-.0631666	.0509125
lgdp	.6109861	.9144395	-.3034534	.517107
lpop	-2.284807	-1.342125	-.9426822	2.369458
opec	-.0237789	-.0185063	-.0052726	.002616

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 15.63
Prob>chi2 = 0.0036