The International Review of Financial Consumers, Volume.4 Issue.1(Apr., 2019), 39-49
pISSN 2508-3155 eISSN 2508-464X

The International Review of Financial Consumers

www.eirfc.com

How Does Medical Expenditure Affect Economic Development? Evidence from OECD countries

Kim, Do Yeon[1] · Jung, Hong Joo[2†] · Kim, Bohyun[3]

A B S T R A C T

This study views medical expenditure as an enhancement factor to human capital and, as such, medical expenditure and national healthcare system can have a positive impact on economic development. Using a non-balanced panel data of 26 OECD countries during the period of 1980 and 2008, we find that, as expected, the level of medical expenditure has a positive effect on economic development. In particular, total medical expenditure, public health expenditure and current health expenditure all show a positive effect while cost of capital for forming health care system has a negative impact on economic growth. No statistically significant effect of private health insurance expenditure is found. The effect of national healthcare system is also examined. Both National Health Service and National Health Insurance groups indicate a positive effect on economic progress with respect to total medical expenditure and public health expenditure. On the other hand, current health expenditure and private health insurance expenditure positively affect the National Health Insurance countries but negatively affect the National Health Service countries.

Keywords: Medical Expenditure, Healthcare System, Dynamic Panel Data Model, Economic Development

Ⅰ. Introduction

Private health insurance may be one of the key areas to attract increasing attention of financial consumers in economy while it is also crucially important in politics for some countries such as the USA which lacks in nationwide health insurance system. Does private health insurance or public health insurance help financial consumers or national economic growth? Aging trend of global population, along with growing expenditure on healthcare services, has brought the services and corresponding financing system as a top priority in government policies in many countries.

A number of economists believe healthier people can be more productive, suggesting better health performance can generate better economic performance if other factors are held constant (Hartwig, 2010). Not only health has been viewed as a critical component for economic growth (Sen, 1999), healthy population has also implied more productive labour input for economic development (Bloom and Canning, 2000). Moreover, according to The Commission on Macroeconomics and Health(2001), investment in health has facilitated both economic development and poverty reduction. Also, accessibility to adequate treatment for curable diseases has accounted for the poverty level of households (Liu et al., 2003). Therefore, it is assumed that health, economic growth and poverty reduc-

1 Researcher, Global Insurance and Pension Research Center, Sung Kyun Kwan University, South Korea
2† Professor, Department of International Trading, Sung Kyun Kwan University, South Korea
3 Researcher, Department of International Trading, Sung Kyun Kwan University, South Korea

tion are closely linked.

Furthermore, healthcare has improved economic growth as well as health itself (Roberts et al., 2004). Healthcare service includes both consumption and investment elements. Previously, healthcare service was perceived as consumption goods needed for better quality of life. As economic theories evolved, health and education have become recognised as human capital, which allows to evaluate healthcare service as investment goods that secure quality of labour and productivity (Kim et al., 2012).

Since Schultz(1961) first recognised health as human capital, a series of previous studies have reviewed the connection between health and economy which is discussed in the following section. Based on the previous literature, this study considers medical expenditure as human capital and explores the effect of medical expenditure and national healthcare system on economic growth. Using dynamic panel data of 26 OECD countries, System GMM is estimated to examine how different structures of healthcare spending and national healthcare system affect economic growth.

Ⅱ. Literature Review

Since Schultz(1961) first referred health as human capital, a number of authors have viewed health as a vital factor for future productivity. Mankiw, Romer and Weil(1992) explored the impact of savings, education and population growth on countries' income using Augmented Solow Model, which further considered human capital in Solow Model. Barro(1997) and Gemmell(1996) stated health positively affected economic growth. Besides, Knowles and Owen(1995) revealed the relationship among health, education and economic growth, which greatly influenced the future studies.

Initially, health was measured only by life expectancy that was inclined to indicate a positive effect on GDP per capita in general (Knowles and Owen, 1995; Bloom et al., 2001; McDonald and Roberts, 2002; Li and Huang, 2010). However, with MRW model applied for 84 countries, Knowles and Owen(1995) explained the effect was more appealing in low-income countries even though life expectancy generally showed a positive relationship with economic growth.

Recently, a variety of proxies for health capital have been introduced. For example, McDonald and Roberts(2002) applied infant mortality and life expectancy as health variables of 5 yearly averages for 77 countries (22 OECD countries, 55 low-income countries(excluding OECD countries), 39 low-income countries (excluding South American Countries)). The result implied health had a positive impact on low-income countries, whereas no significant effect was discovered in OECD countries.

Also, Li and Huang(2010) employed life expectancy and mortality as proxies for health for Southern Asian countries between 1961 and 2007. In their MRW model, health and eduction were shown as critical factors for economic growth even after Asian Financial Crisis. Moreover, health suggested a stronger statistical significance than education. Adult survival rate as a proxy for health was also adopted. Using the survival rate, Bhargava et al.(2001) and Jamison et al.(2005) explained health positively influenced economic growth.

Li and Huang(2009) additionally considered healthcare environment for 28 cities in China during the period of 1978 and 2006 to probe the connection among health, education and economy. China is a developing country, for fundamental education is critical. Therefore, the number of primary school students per teacher was defined as education capital. Besides, the ratio of population with or above secondary education was also considered. As for health capital, the number of beds and doctors every population of 10,000 was used. The empirical result explained health had a positive nexus with economic growth. When both education and health capital were jointly examined, the effect was somewhat identical to a certain degree but education capital showed a stronger significance than health capital.

In recent studies, scholars such as Heshimati(2001), Gyimah-Brempong and Wilson(2004), Rivera and Currais (2004) and Hartwig(2010) introduced medical expenditure as health capital. Interestingly enough, each of the results varied. Heshimati(2001) investigated the causality between GDP and medical expenditure. Using data from OECD for the period of 1970 and 1992 for the estimation of Augmented MRW model, he suggested medical expenditure caused a positive effect on economic growth.

Gyimah-Brempong and Wilson(2004) explored the relationship between health and economy to analyse the different effects between developing countries and developed countries. Through the estimation of GMM model

based on dynamic panel data of 4 yearly averages for the period of 1961 and 1995, health capital both in OECD countries and sub-Saharan African countries evidenced its positive impact on GDP per capita.

On the other hand, Hartwig(2010) revisited the connection between medical expenditure and economic development using data of 21 OECD countries between 1970 and 2005. Various models were estimated such as OLS, Arellano-Bond one-step GMM and Arellano-Bond two-step GMM. The results indicated health capital had an inverse relationship with long-term economic progress.

While health capital has certainly showed a positive impact on GDP in poor countries, the results on the relationship have differed in rich countries(Weil, 2007). For instance, Heshimati(2001) Rivera and Currais(1999a, 1999b, 2003) proffered that increasing medical expenditure improved productivity among OECD countries. Conversely, Hartwig(2010) argued there was no relationship between health capital and economic growth in developed countries. Similarly, Knowles and Owen(1995), McDonald and Roberts (2002) rejected the hypothesis that life expectancy promoted productivity in rich countries. Bhargava et al.(2001) proved that adult mortality had a negative impact on economic growth especially in the United States, France and Switzerland.

Furthermore, it is crucial to question the impact of public healthcare system on economic growth. Rivera and Currais(2004) surveyed the impact of public medical expenditure on productivity in 17 cities of Spain. The research witnessed there was a positive connection between the two factors. However, when the public health expenditure was split into two groups, i.e. current health expenditure and health capital formation cost, current health expenditure showed a positive effect on economic growth while health capital formation cost did not indicate any relationship.

Also, it should be addressed that the role of private health insurance is as much important as public healthcare system. Insurance essentially provides protection for risks, which can not only directly influence national income but also indirectly contribute to both increase and stability in income. In addition, insurance has facilitated households' spending and employment, which effectively increases national income. In particular, life and healthcare insurance can play a significant role in national wealth by fostering firms' production activities(Jung et al., 2000). Even so, little research has been conducted to define the macro effect of private health insurance as each country has different standards in the private sector. Nam(2006) probed the relation between insurance industry and economic development among 16 countries with GDP per capita being over USD 20,000. Gross written insurance was used as a proxy for each insurance industry. Impulse Reaction Analysis and ANOVA were carried out, which proved that insurance industry promoted economic growth. Also, it explained that insurance produced stablising effect for inflation and employment.

Finally, Propper(2000), Gruber and Simon(2008) identified the relationship between public and private healthcare expenditure. Applying the UK Households panel data from 1991 to 2000, Propper(2000) revealed private healthcare sector played a complimentary role in public healthcare sector. Gruber and Simon(2008) analysed the effect of expanded coverages of Medicaid and Medicare on private insurance sector. The result suggested there was a crowding-out effect between the two healthcare systems.

Based on the previous literature, this study aims to address the effect of health on economic growth among OECD countries. As previously mentioned, health capital was measured by various proxies. In this study, medical expenditure is employed to explore its effect on economic growth. Different types of medical expenditure on economy are considered as well. Table 1 summarises the previous studies on the relationship between health capital and economic development.

Ⅲ. Research Methodology and Data

A. Research Methodology

This study imitates Knowles and Owen(1995)'s approach, which includes both education and health as human capital in neoclassical growth model that was first proposed by Solow in 1956. Also, dynamic panel data is employed to conduct the analysis.

Although static panel data model can reflect unique traits of each data due to individual-specific effects, it excludes time-series effect of dependant variables as it can not consider internal factor of dependant variables. Dynamic panel data model overcomes such limitation

Table 1. Previous Studies on the Relationship between Health Capital and Economic Development

Researcher(s)	Proxy for Economic Development	Proxy for Health Capital	Countries/Period	Result
Barro & Sala-i-Martin (1995)	GDP per capita growth rates	Life expectancy	134 countries/ 1965-1985	0.046*-0.082*
Knowles & Owen (1995)	GDP per worker	80-Life expectancy	84 countries/ 1960-1985	0.342*-0.381*
Rivera & Currais (1999a)	GDP per worker	Medical expenditure /GDP	OECD countries/ 1960-1990	0.22*-0.33*
Rivera & Currais (1999b)	GDP per worker	Medical expenditure /GDP	OECD countries/ 1960-1990	0.21*-0.22*
Bloom et al. (2001)	GDP per capita growth rates	Life expectancy	104 countries/ 1960-1990	0.04*
Bhargava et al. (2001)	GDP per capita growth rates	Adult survival rate	73-92 countries/ 1965-1990	0.181*-0.358*
Heshimati (2001)	GDP per worker	Medical expenditure per capita	22 OECD countries/ 1970-1992	0.175*
McDonald & Roberts (2002)	GDP per worker	80-Life expectancy	77 countries/ 1960-1989	-0.006-0.12*
Rivera & Currais (2003)	GDP per worker	Medical expenditure /GDP	OECD countries/ 1960-2000	0.18*-0.26*
Rivera & Currais (2004)	GDP per worker growth rates	Public medical expenditure	17 cities of Spain/ 1973-1993	0.13*
Gyimah-Brempong & Wilson (2004)	GDP per capita growth rates	Medical expenditure /GDP, Child Mortality,	22 OECD countries, 21Sub-Saharan African countries/ 1961-1995, 1975-1994	0.0493*-0.0907*
Jamison et al. (2005)	GDP per capita	Adult survival rate	53 countries/ 1965-1990	0.50*
Li & Huang (2009)	real GDP per capita	the no. of beds and doctors per 10,000 people	28 cities of China 1978-2005	0.12*-0.55*
Li & Huang (2010)	real GDP per capita	Life expectancy, Mortality	10 South Asian countries/ 1961-2007	0.62*-0.91*
Hartwig (2010)	real GDP per capita	Real medical expenditure per capita	21 OECD countries/ 1970-2005	-0.124-(-0.210*)

Note: * denotes statistical significance.

by considering lagged dependant variables in static panel data model. According to Hsiao(1986), the equation of dynamic panel data model that dependant variables follow a first-order auto regression can be constructed as follows:

$$Y_{it} = \alpha + \gamma Y_{it-1} + \beta X_{it} + \epsilon_{it}, \quad \epsilon_{it} = u_i + e_{it}$$

Y_{it} stands for dependant variables observed in country i of year t; X_{it} independent variables; α constant; u_i individual effects; and e_{it} errors. In relation to static dynamic panel data model, X_{it} and u_i can have correlations, which is not seen as critical in dynamic panel data model. However, it is particularly vital to verify the correlations between Y_{it} and u_i when estimating GMM because the correlations can still exist even after difference, i.e. $\Delta Y_{it} = Y_{it} - Y_{it-1}$ and $\Delta u_{it} = u_{it} - u_{it-1}$. For this reason, Arellano and Bond(1991) used lagged variables as instrument variables. As such, in the first difference of regression equation, lagged independent variables in level are used as instrument variables, while in the level of regression equation, lagged independent variables in first difference are used as instrument variables.

The following is the panel data linear regression model for the analysis of the relationship between medical expenditure and economic growth:

$$\ln GDP = \alpha + \beta_1 \ln GDP_{-1} + \beta_2 \ln HE + \beta_3 \ln PEE + \beta_4 \ln TT + \beta_5 \ln (n + g + \delta) + u_i + e$$

In the equation, *GDP* indicates real GDP per capita (US$ PPP); *HE* total medical expenditure per capita (US$ PPP); *PEE* gross enrollment ratio (primary and secondary school combined); *TI* total investment rate (as a percentage of GDP); $n+g+\delta$[1] workforce growth. It is noted that medical expenditure is divided into several types - total medical expenditure, public health expenditure, health capital formation cost, current health expenditure and private health insurance expenditure so that each of the effects on GDP can be estimated.[2]

B. Data and Variables

This study explores how medical expenditure influences economic development[3]. For the analysis, unbalanced panel data from 26 OECD countries during the period of 1980 and 2008 is used.[4][5] Only 5 countries including Finland, South Korea, Spain and etc. have the complete data set for the observation period. Having said that, various countries are still considered in spite of inconsistent observation periods. In addition, the effect of different national healthcare systems is also examined. Broadly, there are two types of healthcare systems: National Health Service and National Insurance Service. Countries that provide healthcare through National Health Service include Australia, Canada, Denmark, Iceland, Ireland, Italy, New Zealand, Portugal, Sweden and the UK. Countries that provide healthcare through National Health Insurance include South Korea, Austria, Belgium, Czech Republic, Finland, France, Greece, Hungary, Japan, Mexico, Netherlands, Norway, Poland, Spain and Switzerland. Unlike the past studies, the United States is excluded because it does not offer healthcare on a national basis for it may distort the result.

Real GDP per capita (*GDP*) is a dependant variable for economic growth, which is extracted from OECD and expressed in PPP[6] terms. Various types of medical expenditure per capita are considered as health capital. By doing so, it can observe each of the different effects on economic growth: Total Medical Expenditure(*THE*), Public Health expenditure(*PHE*), Health Capital Formation Cost (*PFHE*), Current Health expenditure (*PCHE*), Private Health Insurance Expenditure (*PIHE*). Gross Enrollment Ratio (*PEE*) substitutes for education capital. Finally, Total Investment rate(as a percentage of GDP) (*TI*) is also examined. Table 2 describes the definition of each variable and its sources.

C. Descriptive Statistics

Table 3 illustrates descriptive statistics of medical expenditure in OECD countries. The total data set consists of 664 observations from 26 OECD countries during the period of 1980 and 2008. As mentioned earlier, it is an unbalanced panel data of which observation periods are not completely consistent. As such, there exist some missing values and the observed values in each model are different.

With regard to national healthcare systems, 269 observations are produced from the National Health Service group while 395 observations from the National Health Insurance group. As shown in Table 4, the National Health Service group indicates slightly higher GDP per capita and Gini's coefficient. Also, they spend more on public health expenditure, while the National Health Insurance group spend more on private health insurance expenses. There is no substantial difference in health capital formation cost however, there exists a gap between the two groups in relation to current health expenditure.

---

[1] '$n+g+\delta$' accounts for the total value of population growth, technical growth and depreciation rate. $g+\delta$' is 0.05(5%) suggested by Mankiw et al.(1992)

[2] This study examines four different models. Each model considers different types of medical expenditure to analyse each of the effect, i.e. total medical expenditure, public health expenditure, health capital formation cost, current health expenditure and private health insurance expenditure.

[3] Stata 11.0 is used for the data analysis.

[4] Balanced panel data for the period of 1999 and 2008 is also examined, including 13 countries of Australia, Ireland, Italy, Portugal, Austria, Finland, France, Germany, Hungry, Japan, South Korea, Mexico and Spain. This is to address the recent impact of increasing medical expenditure on economy, which is mainly due to the rising number of elderly population and advance in technology. It can provide a supplementary explanation for the empirical results.

[5] Hsiao(2000) explained sorting countries by income allows to analyse the relationship between health and economy in a more efficient manner as it allows us to easily identify different healthcare systems, the size of the healthcare funds and financial risks arising from unhealthy population.

[6] Since every country has a different purchasing power for one US dollar, it may lead to distort the comparative results. In order to overcome the limitation, PPP is applied, which provides information on what one US dollar can buy in different countries by considering the price level of each country. PPP herein stands for Purchasing Power Parity(Henderson, 2009).

Table 2. Definition of Variables and Sources

Variables	Definition	Source(s)
GDP	Real GDP per capita (US$ PPP)	OECD statistics
THE	Total Medical Expenditure per capita (US$ PPP)	OECD statistics
PHE	Public Health Expenditure per capita (US$ PPP)	OECD statistics
PFHE	Health Capital Formation Cost per capita (US$ PPP)	OECD statistics
PCHE	Current Health Expenditure per capita (US$ PPP)	OECD statistics
PIHE	Private Health Insurance Expenditure per capita (US$ PPP)	OECD statistics
PEE	Gross Enrollment Ratio (primary and secondary combined)	World Bank Edstats
TI	Total Investment Rate (as a percentage of GDP)	OECD statistics

Table 3. Descriptive Statistics of Medical Expenditure in OECD countries

	NOB.	Mean	S.D.	Max.	Min.	Observation period[1)]
GDP	664	52386.16	15010.06	95720.32	14105.08	1980-2008
GINI	642	28.94	5.15	49.50	19.70	1980-2008
THE	662	1687.79	983.61	5229.80	88.70	1980-2008
PHE	639	1261.35	761.15	4408.40	19.10	1980-2008
PFHE	512	58.31	43.20	273.00	2.20	1980-2008
PCHE	512	1193.16	731.13	4151.00	16.50	1980-2008
PIHE	387	110.6718	122.53	509.30	0.30	1980-2008
PEE	642	102.04	8.64	135.22	83.24	1980-2008
TI	664	22.71	5.42	47.79	10.39	1980-2008

Notes: 1) Different observation period is acquired for each country and model.
2) The statistic value of *PHE* is from Model 2; *PFHE* and *PCHE* Model 3; and *PIHE* Model 4. And the rest is from Model 1.

Table 4. Descriptive Statistics of Medical Expenditure in Different National Healthcare Systems

	NHS				NHI			
	NOB.	Mean	Max.	Min.	NOB.	Mean	Max.	Min.
GDP	269	52888.97	23366.84	12437.92	395	52043.90	95719.40	14105.88
GINI	250	29.30	36.23	19.70	392	28.72	49.5	20.49
THE	269	1761.15	4052.29	276.63	393	1637.58	5229.98	88.70
PHE	269	1369.50	3430.84	177.71	370	1182.71	4408.59	19.10
PFHE	222	1.05	1.22	1.02	290	1.05	1.18	1.01
PCHE	222	1287.80	3268.14	162.59	290	1120.64	4151.45	16.50
PIHE	150	97.77	509.33	.50	233	120.86	505.01	.30
PEE	256	103.12	131.61	83.23	386	101.32	135.21	83.62
TI	269	21.37	42.30	11.50	395	23.62	47.79	10.39
PGRW	269	.64	2.86	-.74	395	.53	26.45	-.83
GD	218	53.11	113.67	4.92	361	48.04	180.78	4.08

Notes: 1) Different observation period is acquired for each country and model.
2) The statistic value of *PHE* is from Model 2; *PFHE* and *PCHE* Model 3; and *PIHE* Model 4. And the rest is from Model 1.

Ⅳ. Empirical Results

A. The Effect of Total Medical Expenditure on Economic Development

Table 5. shows the estimated result of System GMM describing the effect of total medical expenditure on economic development. Given each country has different observation periods, four different models are applied- Model 1 only considers total medical expenditure; Model 2 public health expenditure only; Model 3 health capital formation cost and current health expenditure; and Model 4 current health expenditure and private health insurance expenditure.

All the models evidence total medical expenditure, public health expenditure and current health expenditure have a positive connection with GDP. However, health capital formulation cost negatively impacts on GDP. This indirectly implies the effect of healthcare infrastructure is not immediately reflected in the corresponding year. The effect of private health insurance expenditure has no statistically significance. Gross enrollment ratio and total investment rate positively affect GDP while workforce negatively affects GDP.

Autocorrelation of errors is verified by Arellano Bond test. The test results show e_{it} has a first-order autocorrelation. Also, Sargan test is carried out to test over-identifying restrictions. The test indicates p-value is nearly 0, which questions the fitness of model. However, it should be noted that Sargan test results do not necessarily mean instrument variables are not suitable as it can reject the null hypothesis that over-identifying restrictions are valid when the heteroskedasticity test shows a weak statistical power and the number of instrument variables is bigger than that of panel groups.

Table 6. shows the estimated result of System GMM using balanced panel data of 13 OECD countries for the period of 1999 and 2008. It examines the recent impact of sharp rise in medical expenditure on economic growth. Unlike the previous result from Table 5, increasing medical expenditure after 2000s has a negative impact on economic growth. Total medical expenditure, public health expenditure and current health expenditure have an inverse relationship with GDP. Due to the similar economic characteristics of OECD members, the similar patterns can be observed within the OECD countries.

Table 5. The Effect of Total Medical Expenditure on Economic Development (1980-2008)

	(1)	(2)	(3)	(4)
$GDP(t-1)$	.891*** (.016)	.875*** (.018)	.844*** (.017)	.923*** (.026)
THE	**.025*** (.006)			
PHE		**.027*** (.006)		
$PFHE$			**-.124*** (.065)	
$PCHE$			**.032*** (.006)	**.011*** (.007)
$PIHE$				.0004 (.004)
PEE	.089*** (.027)	.114*** (.029)	.113*** (.025)	.102*** (.034)
TI	.096*** (.009)	.097*** (.009)	.082*** (.009)	.087*** (.011)
$n+g+\delta$	-.126*** (.025)	-.118*** (.025)	-.093*** (.023)	-.110*** (.029)
$constant$	.227** (.094)	.238** (.098)	.374*** (.085)	.095 (.129)
number of obs.	617	594	476	347
number of groups	26	26	23	23
number of instruments	59	59	240	158
Sargan test (p-value)	.000	.000	.000	.000
AR(1) test (p-value)	.002	.002	.005	.008
AR(2) test (p-value)	.337	.280	.492	.906

Notes: 1) ****, ** and * denote significance at 1%, 5% and 10% levels.
2) figures in parenthesis indicate standard deviation.

Table 6. The Effect of Total Medical Expenditure on Economic Development (1999-2008)

	(1)	(2)	(3)	(4)
$GDP(t-1)$	1.053*** (.049)	1.057*** (.061)	1.062*** (.061)	1.064*** (.065)
THE	**-.044***** (.017)			
PHE		**-.040**** (.019)		
$PFHE$			.013 (.012)	
$PCHE$			**-.050**** (.021)	-.042 (.028)
$PIHE$				-.0003 (.010)
PEE	-.051 (.118)	-.042 (.118)	-.049 (.118)	-.040 (.119)
TI	.152*** (.038)	.144*** (.038)	.139*** (.038)	.135*** (.039)
$n+g+\delta$	.068 (.050)	.060 (.050)	.053 (.049)	.058 (.052)
$constant$	-.257 (.268)	-.294 (.299)	-.288 (.296)	-.315 (.305)
number of obs.	117	117	117	117
number of groups	13	13	13	13
number of instruments	21	21	22	22
sargan test (p-value)	.009	.004	.001	.003
AR(1) test (p-value)	.100	.109	.113	.110
AR(2) test (p-value)	.284	.286	.283	.290

Notes: 1) ***, ** and * denote significance at 1%, 5% and 10% levels.
2) figures in parenthesis indicate standard deviation.

B. The Effect of National Healthcare System on Economic Development

Table 7 shows the effect of different national healthcare systems on economic development. Both National Health Service and National Health Insurance countries positively influence total medical expenditure and public healthcare expenditure. Only the countries with the National Health Insurance scheme show a positive effect on economic growth in relation to health capital formation cost, current expenditure and private health insurance expenditure. Gross enrollment rate has only a positive impact on the countries with the National Health Service while no significant result is found in the countries with the National Health Insurance scheme. With regard to the effect of total investment rate, both groups show a statistically positive significance. On the other hand, workforce growth rate negatively affects the countries with the National Health Insurance scheme.

Ⅴ. Conclusion

Private health insurance may be one of the key areas to attract increasing attention of financial consumers in economy while it is also crucially important in politics for some countries such as the USA which lacks in nation-wide health insurance system. Does private health insurance or public health insurance help financial consumers or national economic growth? Aging trend of global population, along with growing expenditure on healthcare services, has brought the services and corresponding financing system as a top priority in government policies in many countries.

This study analyses how healthcare expenditure and national healthcare system can impact on economic growth. Based on Augmented Solow Growth Model introduced by Knowles and Owen(1995), System GMM is estimated to account for the empirical anaylsis. Using unbalanced panel data of 26 OECD countries, real GDP per capita is used as a proxy for economic growth and different types of medical expenditure are considered as health capital. Gross enrollment ratio, total investment rate and workforce growth are also considered. Overall,

Table 7. The Effect of National Healthcare System on Economic Development

	(1)	(2)	(3)	(4)
NHS				
$GDP(t-1)$	.889*** (.032)	.894*** (.033)	1.036*** (.030)	1.129*** (.035)
THE	**.020*** (.011)			
PHE		**.018*** (.011)		
$PFHE$			-.042 (.112)	
$PCHE$			-.034*** (.011)	-.060*** (.012)
$PIHE$				-.012*** (.004)
PEE	.183*** (.032)	.191*** (.032)	.147*** (.030)	.151*** (.047)
TI	.064*** (.014)	.064*** (.014)	.052*** (.013)	.038** (.015)
$n+g+\delta$	-.110*** (.030)	-.121*** (.030)	-.131*** (.034)	-.055 (.052)
$constant$	.096 (.111)	.072 (.108)	-.324*** (.101)	-.711*** (.148)
number of obs.	246	246	200	130
number of groups	10	10	9	9
number of instruments	85	110	60	60
Sargan test (p-value)	.000	.000	.000	.001
AR(1) test (p-value)	.022	.016	.034	.068
AR(2) test (p-value)	.206	.184	.952	.672
NHI				
$GDP(t-1)$	.921*** (.013)	.908*** (.015)	.909*** (.017)	.862*** (.040)
THE	**.026***** (.005)			
PHE		**.023***** (.005)		
$PFHE$			**.188*** (.106)	
$PCHE$			**.028***** (.006)	**.025***** (.008)
$PIHE$				**.010*** (.006)
PEE	.030 (.040)	.055 (.045)	.117* (.065)	-.081 (.066)
TI	.105*** (.011)	.107*** (.011)	.123*** (.014)	.106*** (.014)
$n+g+\delta$	-.053* (.030)	-.032 (.031)	-.023 (.033)	-.132*** (.037)
$constant$	.130 (.091)	.122 (.098)	-.038 (.141)	.676*** (.232)
number of obs.	371	348	272	217
number of groups	16	16	14	14
number of instruments	59	59	60	60
Sargan test (p-value)	.000	.000	.000	.001
AR(1) test (p-value)	.025	.028	.045	.048
AR(2) test (p-value)	.830	.719	.489	.989

Notes: 1) ***, ** and * denote significance at 1%, 5% and 10% levels.
2) figures in parenthesis indicate standard deviation.

medical spending proves a positive impact on economic development. During the period of 1980 and 2008, total medical expenditure, public health expenditure and current medical expenditure evidence a positive effect on economy, whereas health capital formation cost generates a negative effect on the growth. This can be surmised that the effect of healthcare infrastructure is not immediately reflected in the corresponding year. The effect of private health insurance expenditure shows no statistically significance.

Balanced panel data between 1999 and 2008 is also examined. Unlike the previous result, total medical expenditure, public health expenditure and current medical expenditure negatively affect economic development, Also, no significant effect on economy is found in relation to capital formation cost and private health insurance expenditure. This implies the sharp rise of medical expenditure after 2000s has a negative impact on economic growth.

The effect of national healthcare system is explored. Both National Health Service and National Health Insurance groups suggest a positive relationship with economy in terms of total medical expenditure and public health expenditure. However, current health expenditure and private health insurance expenditure positively affect the National Health Insurance countries while negatively the National Health Service countries.

To summarise, the empirical findings imply that financial consumption of private health insurance can influence overall economic growth rate, depending upon which healthcare systems countries have. Future research may be covering updated dataset or analytical tools with innovative technology in health care management and financing.

References

Arellano, M., & Bond, S.R.(1991). Some of tests of specification for panel data: Monte Carlo evidence and an application to employment equation. *Review of Economic Studies,* 58, 277-297.

Arellano, M., & Bover, O.(1995). Another look at the instrumental variables estimation of error-components models. *Journal of Econometrics,* 68, 29-51.

Barro, R.J., & Sala-i-Martin, X.(1995). *Economic Growth.* New York: McGraw Hill.

Barro, R.J.(1997). *Determinants of Economic Growth: A cross-country empirical study*. Cambridge Massachusetts: The MIT Press.

Bhargava, A., Jamison, D. T., Lau, L. J., & Murray, C. J.(2001). Modeling the effects of health on economic growth. *Journal of Health Economics,* 20, 423-440.

Bloom, D.E., & Canning, D.(2000). The health and wealth of nations. *Science,* 287(5456), 1207-1209.

Bloom, D.E., Canning, D., & Sevilla, J.(2001). The Effect of Health on economic growth: theory and evidence. *NBER Working Paper,* No. 8587.

Commission on Macroeconomics and Health(2001). *Macroeconomics and Health: investing in health for economic development.* Geneva: World Health Organization.

Gemmell, N.(1996). Evaluating the impacts of human capital stocks and accumulation on economic growth: some new evidence. *Oxford Bulletin of Economics and Statistics,* 58, 9-28.

Gruber, J., & Simon, K.(2008). Crowd-out ten years later: have recent public insurance expansions crowded out private health insurance? *Journal of Health Economics,* 27, 201-217.

Gyimah-Brempong, K., & Wilson, M.(2004). Health human capital and economic growth in Sub-Saharan African and OECD countries. *The Quarterly Review of Economics and Finance,* 44(2), 296-320.

Hartwig, J.(2010). Is health capital formation good for long-term economic growth? - panel Granger-causality evidence for OECD countries. *Journal of Macroeconomics,* 32, 314-325.

Henderson, J.W.(2009). *Health Economics and Policy.* Mason :Cenage Learning

Heshimati, A.(2001). On the causality between GDP and health care expenditure in augmented Solow growth model. *Stockholm School of Economics Working Paper in Economic and Finance,* 423.

Hsiao, W.C.(1986). *Analysis of panel data.* Cambridge: Cambridge of University Press.

Hsiao, W.C.(2000). *What should macroecoonomicsts know about health care policy? A Primer* (IMF Working Paper No.136). Retrieved from http://www.imf.org /external/pubs/ft/wp/2000/wp00136.pdf

Jamison, D. T., Lau, L. J., & Wang, J.(2005). Health's contribution to economic growth in an environment of partially endogenous technical progress In: López-Casanovas, G., Rivera, B., & Currais, L. (2005). *Health and Economic Growth: Findings and Policy Implications.* Cambridge:MIT Press, 67-91.

Jung, H. J., Jung, H.S., & Choi, M.(2000). An empirical study on the relationship among GNP, Savings and Insurance. *Korea Insurance Journal,* 56, 91-116.

Kim, B.W., Yun, Bj., Yun, C.G., Lee, J.H., Gang, S.M., Kim, S.W., Park, G.S., ... Yoo, J.Y.(2012). *Theory*

and Practice on Health Insurance, Seoul: Gyechukmunhwasa.

Knowles, S., & Owen, P. D.(1995). Health capital and cross-country variation in income per capita in the Mankiw-Romer-Weil model. *Economics Letter,* 48, 99-106.

Li, H., & Huang, L.(2009). Health, education, and economic growth in China: empirical findings and implications. *China Economic Review,* 20, 374-387.

Li, H., & Huang, L.(2010). Health, education, and economic growth in East Asia. *Journal of Chinese Economic and Foreign Trade Studies,* 3(2), 110-131.

Liu, Y., Hsiao, W. C., & Rao, K.(2003). Medical spending and rural impoverishment in China. *Journal of Health Population and Nutrition,* 21(3), 216-222.

Mankiw, N.G., Romer, D., & Weil, D.N.(1992). A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics,* 107, 407-439.

McDonald, S., & Roberts, J.(2002). Growth and multiple forms of human capital in an augmented Solow model: a panel data investigation. *Economic Letters,* 74, 271-276.

Nam, S.(2006), A study on the causality between the insurance and economic growth. *Korea Insurance Journal,* 74, 169-197.

OECD(2011). *OECD Health at a Glance 2011.*

OECD(2002). *OECD Health Data 2002: a comparative analysis of thirty countries*, Paris, France: OECD.

Propper, C.(2000). The demand for private health care in the UK. *Journal of Health Economics,* 19, 855-876.

Rivera, B., & Currais, L.(1999a). Economic growth and health: direct impact or reverse causation? *Applied Economics,* 33, 761-764.

Rivera, B., & Currais L.(1999b). Income variation and health expenditure: evidence for OECD countries. *Review of Development Economics,* 3, 258-267.

Rivera, B. & Currais, L.(2003). The effect of health investment on growth: a causality analysis. *International Advances in Economic Research,* 9, 312-323.

Rivera, B. & Currais, L.(2004). Public health capital and productivity in the Spanish regions: a dynamic panel data model. *World Development,* 32, 871-885.

Roberts, M.J., Hsiao, W. C., Berman, P., & Reich, M. R.(2004). *Getting health reform right: a guide to improving performance and equity.* Oxford University Press.

Schultz, T.W.(1961). Investment in human capital. *American Economic Review,* 51, 1-17.

Sen, A.(1999). *Development as Freedom*, Oxford University Press.

Solow, R.M.(1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics,* 70, 427-443.

Weil, D.N.(2007). Accounting for the effect of health on economic growth. *Quarterly Journal of Economics,* 122(3), 1265-1306.

Received/ 2019. 03. 04
Revised/ 2019. 03. 20
Accepted/ 2019. 03. 24