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THE RELATIONSHIP BETWEEN HEALTH AND GROWTH IN EURASIAN ECONOMIC UNION*

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Abstract

This paper examines the long run and causal relationship between health expenditures and economic growth in the in Eurasian Economic Union over the period 1995-2014. For this examination, panel cointegration and causality methodologies are utilized. Cointegration results which obtained from Pedroni and Kao tests support an evidence of a long run relationship among the variables under investigation. Long run elasticities indicate that health expenditures affect growth positively. Causality results, on the other side, provide a strong support of a bi-directional running between health expenditures and economic growth both in the short and in the long run.

Keywords: Health Expenditures, Economic Growth, Eurasian Economic Union

1. Introduction

Health is among the one of the determinants of growth processes a component of human capital. According to human capital theory, one who developed the knowledge and skills can increase economic activity via productivity increase (Mehrara and Musai, 2011). However it is necessary for any person to have high levels of health to get an education and to engage in economic activities. Indeed, one can mention a strong correlation between health levels and the growth rate of a society. The share allocated to health expenditures is expected to increase with the increases with the increases in economic growth rate. The improvement of health is regarded as one of the main elements of this economic development (Barro, 2013).Barro and Sala-i Martin (1995) further state the importance of life expectancy as a health indicator in the process of economic growth.

Grossman (1999) has initially addressed health as a durable capital stock separately from human capital. He uses health variable as a result of health system variable which has been taken place as production entry within the household production function. He states that health capital plays an important role for the time needed to obtain person's property and

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money while human capital increasing the productivity of people in the market. But at the same time, health system and education system are both defined as an indicator of human capital (Kaufman and Gary, 2007).

Many studies that reviewed the causal relationship between health expenditure and economic growth widely use different groups of countries and time periods (Adeniyi and Abiodun, 2011; Tang, 2009; Hartwig, 2008). They found a significant causality. Narayan *et al.* (2010) found that health has a first-hand effect on some factors (labor efficiency, labor force participation, savings rates, investment rates, social welfare and income, etc.) of human capital. Similarly, Smith (2000) stated that healthy individuals will be long-lived and thus these people will provide more benefits to the economy.

The goal of this study is to analyze the cointegration and causality nexus between economic growth and heath expenditure within a panel data framework in the Eurasian Economic Union member states over the period 1995-2014. To this end, annual observations ranging from 1995 to 2014 are used. Although there is an expanded literature on health expenditures-growth rate nexus, no study has been published before in the case of Eurasian Economic Union countries to the best of our knowledge. Thus we expect present paper to contribute to the existing literature by researching these particular groups of countries.

The rest of the paper is as follows. Section 2 gives an overview for literature. Section 3 presents data and model. Section 4 put forward methods and econometric results. Finally section 5 concludes.

2. Review of Literature

Existing literature on the nexus between health and economic growth have provided a large number of empirical evidences. When the papers investigating the nexus between health indicators and economic growth were evaluated, it is being used for different health indicators (healthcare, infant and child mortality rates, life expectancy at birth, health care institutions and medical personnel per capita etc.). Some studies have investigated on relationship between life expectancy at birth and economic growth (Bloom *et al.* 2001; Mayer, 2001; Chakraborty, 2003; Gallup and Sachs, 2000). They found that this variable has a positive effect on growth.

There exist a large number of studies on the effects of health expenditures on economic growth in the literature. The first of these studies is Grossman (1972)'s papers. According to this study, healthcare services expressed as fixed capital stock is a positive impact on economic growth. Many studies have been made on this subject in recent years. Baltagi and Moscone (2010) investigated on long run relationship between health expenditure and economic growth on OECD countries over the period 1971-2004. They found that when the elasticity of health spending is less than 1, health spending is necessary goods rather than luxury good. Ding (2012) explored the impact of economic growth on public health expenditure on all of OECD countries over the period 1980-2007. According to the results of this study, He was found that health expenditure have a positive effect on economic growth. Alongside these studies, Tang (2011) has found bidirectional causality relationship between these variables on Malaysia over the period 1970-2009. In addition, Kuhn and Prettner (2012) found that the employment in the US health sectors has increased growth rate over the period 2008-2012. They stated that countries with a high share of health spending have a higher growth rate compared to others.

Mehrara and Musai (2011) examined causality between health expenditure and economic growth in oil exporting countries. They found that there is a strong causality between economic growth, oil revenues and health spending. In addition to these results, Economic growth and health spending in both directions are interrelated. Elmi and Sadeghi (2012) investigated causality relationship between health expenditure and growth over the period 1990-2009. He found bidirectional causality relationship between these variables. Wang (2011) investigated causality between these variables according to the income level of the country over the period 1986-2007. He found that an increase occurred in health spending in the long term positive affect economic growth.

Unlike other studies, Gerdtham and Jonsson (1991) found that there are not relationship between the relative price of health spending and income on 22 OECD countries. Similarly,

Devlin and Hansen (2001) found no relationship between the variables. But in Gerdtham and Jönsson (2000) study, it's found that the relationship between these variables co-integrated in the long term. Similar to the above studies, the recently studies on the different groups of countries found that health spending is one of the main determinants of growth (see: Li and Huang, 2009; Gyimah-Bremponga and Wilson, 2004; Hartwig, 2010, etc.).Some studies have found a one-way relationship (health expenditure to growth) between the variables (Amiri and Ventelou, 2012;Khandelwal, 2015;Bala, 2011).Another group, Some studies found also a two-way relationship between the variables (Elmi and Sadeghi, 2012; Chaabouni *et al.* 2016).

3. Model and Data

In this paper, we examine the impact of health expenditures on economic growth in the Eurasian Economic Union. Equation (1) below presents the functional form of the relationship.

$$y=f(k, h) \tag{1}$$

where y captures economic growth, k denotes capital accumulation and h signifies health expenditures. Equation (2) below is an augmented panel data format of equation (1).

$$y_{i,t} = \beta_{1i}k_{it} + \beta_{2i}h_{it} + \varepsilon_t \tag{2}$$

The member countries included in the sample are: Armenia, Belarus, Kazakhstan, Kyrgyz Republic and Russian Federation. Annual observations spanning from 1995-2014 are used for growth, capital and health expenditure variables. On the left-hand side, growth (y) is represented by per capital income measured using GDP per capita in current US$. On the right-hand side, capital is represented per capita capital measured as gross fixed capital formation in current US$ in addition to the health expenditures represented by per capita in current US$. In order to convert capital and health variables into per capital terms, population series are used and final data on capital and health variables are calculated by dividing these values to each country's population. All variables are finally converted into natural logarithms. Data for all variables are downloaded from World Bank (2016), World Development Indicators (WDI) Database (August 2016).

4. Empirical Methodology and Findings

It is very well known in econometrics that analysis results would be inconsistent and biased if unstable variables were used. As a beginning step, therefore, potential unit root in the series has to be examined. To this end, commonly used unit root tests in panel data econometrics are Levin *et al.* (2002) and Im*et al.* (2003) tests to investigate whether series have a unit root, or not (hereinafter, LLC and IPS, respectively).

Table 1. Panel unit root results

Variable	LLC		IPS	
Y	-0.479	(0.31)	2.080	(0.98)
K	-1.133	(0.10)	0.816	(0.79)
H	-1.147	(0.12)	1.485	(0.93)
Δy	-5.353	(0.00)	-3.173	(0.00)
Δk	-1.612	(0.05)	-1.834	(0.03)
Δh	-4.619	(0.00)	-4.886	(0.00)

Notes: Δ is first-difference operator. Numbers in parentheses are p-values. Models are estimated with a constant. Spectral estimation is conducted by using Newey-West; Bandwidth selection is done using Bartlett kernel for the LLC. The maximum lag lengths are set to 4 and determined by the SIC.

Table 1 shows the results of these tests. According to the table that null hypothesis indicating series contain unit root cannot be rejected in the levels, but can be rejected in the first difference. As a result, it is found that series in levels contain unit root but series in first differences are stationary, indicating all variables are integrated of I(1) either considering either LLC or IPS.

Having found that the variables under investigation are integrated ofI(1), we can further test the long run nexus among the variables. Most of the multi-country studies within panel data framework have employed Pedroni's (1999) test to investigate the possible cointegration. This study uses Kao's (1999) cointegration test as well as Pedroni's test. Widely employed unit root tests in panel data econometrics is Pedroni's (1999) cointegration test. Table 2 presents the results of Pedroni's cointegration test while table 3 reports results obtained by Kao's test. Null hypothesis indicating no cointegration is rejected by the both tests. As a result, it is proved that growth, capital, and health are moving together in the long run.

Table 2. Panel cointegration results

Dimension	Test	Value
Within group	Panel-v	1.334 (0.09)
	Panel-rho	-1.835 (0.03)
	Panel-pp	-3.718 (0.00)
	Panel-adf	-3.772 (0.00)
Between group	Grup-rho	-0.869 (0.19)
	Grup-pp	-3.858 (0.00)
	Grup-adf	-3.926 (0.00)

Notes: Numbers in parentheses are p-values. Models are estimated with a constant. The maximum lag lengths are set to 4 and determined by the SIC. Panel-v test is a right-tailed test while others are left-tailed.

Table3. Kao Panel cointegrationresults

	t-stat.
ADF	-8.331 (0.00)

Notes: Numbers in parentheses are p-values. Models are estimated with a constant. Spectral estimation is conducted by using Newey-West; Bandwidth selection is done using Bartlett kernel. The maximumlaglengthsare set to 4 anddeterminedbythe SIC.

Following confirming the co-movement in the long run, the long run coefficient can be estimated using different techniques. In this paper we will utilize Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) approaches. Notice that we can interpret estimated coefficients as elasticities as the variables in the model are expressed in natural logarithms. Table 4 reports the long run coefficients obtained from either FMOLS or DOLS model. According to the FMOLS, a 1% increase in capital stock increases growth by 0.079% while a 1% increase in health expenditures increases growth by 1.088%. Results obtained from the DOLS, on the other hand, indicate that a 1% increase in capital stock increases growth by 0.225% while a 1% increase in health expenditures increases growth by 0.857%.

Table 4. Cointegrated regression results

	FMOLS		***DOLS***	
Variable	*k*	*h*	*k*	*h*
Coefficient	0.079(0.00)	1.088(0.00)	0.225(0.00)	0.857 (0.00)

Notes: Numbers in parenthesesare p-values. Models are estimated with a constant. DOLS estimation are carried out with 2 lags and 1 lead.

Once having proved that the variables are cointegrated in the long run, causal relationship between variables can be examined using panel error correction methodology that is principally based on Engle and Granger (1987) procedure. With this technique, one can figure out the short and long run causal relationships among variables Table 5 presents the results of panel causality investigation. Table 5 shows us that there is a bi-directional causality between all variables in the short run. When it comes to long run, it is found that capital and health expenditures Granger cause economic growth in the long run in addition to that capital and economic Granger cause health expenditures.

Table 5. Panel causality results

	Source of causation			
Dependent variables	*y*	*k*	*h*	*ect*
y		11.138 (0.00)	13.394 (0.00)	-0.676 (0.04)
k	54.872 (0.00)		23.593 (0.00)	-0.407 (0.37)
h	31.497 (0.00)	29.827 (0.00)		-0.713 (0.00)

Notes: Numbers in parentheses are p-values. Reported short-run statistics are F-Wald stats. Term “ect” denotes error correction term.

5. Conclusions

The aim of this study is to investigate the long run and causal nexus between health expenditures and economic growth in the Eurasian Economic Union. To this end, annual panel data observations on health, economic growth and physical capital variables are utilized over the period 1995-2014. Pedroni’s (1999) and Kao’s (1999) panel cointegration results reveal that variables are moving together in the long run. Long run coefficients obtained from the FMOLS and DOLS models show that a 1% increase in health expenditures increases economic growth by 1.088% and 0.857%, respectively. Note that the impact of health expenditures on economic growth is even larger than that of capital accumulation. The estimated coefficient on health expenditure from the FMOLS, in particular, is greater than unity. Panel causality results, on the other hand, indicate a bi-directional causality between health expenditures and economic growth in the Eurasian Economic Union states in both short run and long run. These results emphasize the importance of health in growth process in the Eurasian Economic Union states. Policymakers in the Union should consider health as an important determinant of growth. It is apparent that investments toward health system will definitely contribute to economic performance more than increasing physical capital. Governments in these countries should take this opportunity into account, which will in turn add in health system in the long run.

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