The Impact of Health Expenditures on Economic Growth - Evidence from O.E.C.D. Countries

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ABSTRACT

The paper empirically investigates the relationship between health expenditure and economic growth in the O.E.C.D. countries. The data used is collected twenty five O.E.C.D. countries with ob- servations from 1990 to 2018. For health we have used as proxy the health spending, which measures the final consumption of health care goods and services, while for the economic growth we have used as proxy Gross Domestic Product per capita. A variety of tests for unit roots have been conducted for the stationarity in our panel databases, such Levin-Lin-Chu (2002), Harris-Tzavalis (1999), Breitung (2000); Breitung and Das (2005). In order to determine the effects on GDP per capita of the health expenditure, we have estimated the short run and the long run effects of GDP per capita on health expenditure per capita by using the MG (Pesaran and Smith, 1995) and PMG models (Pesaran, Shin and Smith, 1999) using the methodology proposed by Blackburne and Frank (2007). The empirical results sustain the necessity of using the public policy for increasing the health expenditures, as a premise for economic growth.

Keywords: *health expenditures, economic growth, O.E.C.D..*
JEL Classication: *E21, E22, O47.*

1. INTRODUCTION

In this paper we have analyzed some empirical findings regarding the evidence on the contribution of health expenditures to the economic growth. Data used is referring to 25 countries, members of the Organization for Economic Co-operation and Development (O.E.C.D.) for a period of time starting in 1990 and finalizing in 2018. The data is described in the subsection entitled Data description. There is growing literature in this field which focuses on developing countries, and there are also some reports of the international institutions. For example, The World Bank defines the role of health and generally of the financing health in the development of countries (Lea, 1993). The role of health expenditure appear to be different interpreted in poor and developing countries versus the developed countries. As authors suggest (Suhrcke et al., 2006), despite the growing recognition of the role of health in achieving development in poor countries, the situation in developed countries can differ, while the analysis is still related do the cost containment of (health) services. The authors identified at least two factors that could explain why in developed countries the health expenditures may be playing a minor role, including also the attention of the policy makers to this category. Some possible explanations are related to the situation that in rich countries the burden of disease in high income/developed countries is characterized by non-communicable conditions (first argument). The second one is that the production in poor countries depends more heavily on man labor so the health condition is mostly important here. On the other hand, the impact undeveloped countries could be lower because of the technology and robotics use instead of raw work.

2. LITERATURE REVIEW

The role of the health in economic output is treated in the economic literature and suggests a potential mechanism of transmission and the effects of these implications (explained as follows). As stated above, the impact of health condition on economic output and development is related to the fact that health itself affect directly the following factors (Suhrcke et al., 2006), and so can contribute to economic development:

- labor productivity
- labor supply
- education
- savings.

Regarding the first factor (the *labor productivity*), there are evidences that poor health condition is directly associated with the decreases in wages and earnings. On the other side, the use of some indicators such height, weight and body mass index are suggesting that greater height which reflects good health condition in childhood, has a positive impact on wages and earnings. There are also evidences that a higher body mass index can influence the potential earnings , which appear to be lower in this case, or or individual expenditures, that are rising. It results that a good health condition, which can be influenced by the quality of health services (that depend directly on health expenditures), can be considered a premise for economic growth. There are lots of studies that takes into consideration the health condition and its effects on factors that influence employment, working hours, wages, and economic development: impact of health on wages (Contoyannis and Rice, 2001), gender difference and effects on wages (Gambin, 2004), health state impact on employment (Pelkowski and Berger, 2004), health and labor market (Bartel and Taubman, 1979), sickness effects on earnings (Andrén and Palmer, 2001), work absenteeism and wages gaps (Hansen, 2000), obesity impact on wages (d'Hombres and Brunello, 2005), body weight and labor market (Cawley, 2000) .

Labor supply - there is also evidence that health influence labor supply, and some studies have used factors such as: employment, working hours, probability of retiring. The literature had focused on height and labor market (Persico et al., 2004), disability and labor (Lechner and Vazquez-Alvarez, 2003), health and retirement (Sammartino (1987); Coile (2003); Deschryvere (2005); Gustman and Steinmeier (2018)).

There are some quasi-externalization associated with health showing that the ill condition or poor health has impact not only for employment but also for the household members that should adapt their employment in response in response to illness among other family/household members (Bound et al. (2010), Disney et al. (2003), Siddiqui (1997)). There are also findings that men reduce their work levels and it is more likely to exit the labor force when wives become ill, while woman are more likely to work if husbands get the disease, for compensating the household income, regarding the level of education.

The third invoked factor is *education*. There are findings that health affect the educational performance of the population. Better health condition during childhood affects the cognitive development, reduces the school absenteeism and early drop rates. It is explained that healthier individuals have also greater incentives to invest in their intellectual capital. In this approach, their expectation for future benefits are related to a longer period of life. There are also literature articles indicating that conditions in childhood impaired the IQ levels of the individuals with a direct effect one educational level, savings and consumption. (Weiss and Fantuzzo (2001), Smith (1999)).

Savings/ Consumption. It is considered that healthier individuals can save and invest more, so they can acquire larger physical capital, being important factors/ premises for economic growth potential. There are studies that suggests that today's economic wealth are the results of the achievements acquired in health development. It has been estimated that around 50% of the economic growth in the UK between 1780 and 1980 can be explained by the improvement and development in health and nutrition (Fogel, 1999). Another studies in industrialized countries concluded that the development of health and longevity are direct factors for increasing the rate of economic growth by 30% to 40% (Arora (2001), Bloom et al. (2003)).

There is growing literature that is referring to the role of economic growth and policy implications on growth (Kalemli-Ozcan et al. (2000); Thomas et al. (2001); Alsan et al. (2006); Bloom et al. (2002); Bhargava et al. (2001); Beraldo et al. (2005); Tompa (2002)).

The methodology implied and data used in our analysis are presented as follows.

3. DATA AND METHODS

3.1 Data Description

The data is provided by the O.E.C.D. statistics and represent the gross domestic product per capita (GDP per capita, abbreviated *gdpcap*) and public health expenditure (abbreviated *health*) for 25 countries for a period of time starting from 1990 and ending in 2018. The data is structured as panel data, so between and within statistics can be calculated. The descriptive statistics are presented in Table no. 1.

Table 1: Descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Obs.
Country	overall	-	-	1	25	N = 725
year	overall	-	-	1990	2018	N = 725
gdpcap	overall	30973.48	12995.03	5935.07	84575.44	N = 725
	between		7813.77	14710.68	44078.18	n = 25
	within		10496.52	5324.58	76996.30	T = 29
lngdpcap	overall	10.24	0.4555	8.6886	11.3454	N = 725
	between		0.2955	9.5059	10.6444	n = 25
	within		0.3515	9.2989	11.1565	T = 29
health	overall	2686.14	1605.93	151.79	10586.08	N = 725
	between		1136.58	603.36	6193.21	n = 25
	within		1156.35	-806.72	7079	T = 29
lnhealth	overall	7.6961	0.6891	5.0225	9.2673	N = 725
	between		0.5134	6.2012	8.6480	n = 25
	within		0.4706	6.5174	8.7960	T = 29

Source: Author's calculations

The first variable (*health*) have as an overall mean at around 31,000, the standard deviation situated at approximately 13,000, while the minimum is around 6000 and the maximum around 85,000. Regarding the between statistics, the standard deviation is around 8000 with the minimum situated at 15,000 and the maximum around 44,000. The within statistics has the standard at around 10,000 with minimum at 5000 and the maximum around 80,000.

The second variable (*health*) (round 3 in the table) is having an overall mean at around 3000 with the standard deviation at approximate 1600, a minimum at 151, and the maximum at 10,000. The between statistics shows a standard deviation at around 1100 with a minimum around 600 and the maximum around 6000, while the within statistics identifies a standard deviation of 1100, a minimum at around minus eight hundred, and a maximum situated at around 7000.

The next variable is a new created one, being the logarithmic values of GDP per capita. The variable has the overall mean is 10.24 with a standard deviation of 0.45, a minimum around 8.68 and the maximum around 11.34. The between statistics reveals a standard deviation around 0.3 with a minimum at 9.5 and the maximum at 10.6 , while the within has the standard deviation of 0.35, with a minimum at 9.25 and the maximum at 11.15. The next variable represents the logarithmic function of the third variable - *health*, being abbreviated *lnhealth*). The mean of this variable is around 7.7 with a standard deviation of 0.68 a minimum at around 5.02 and maximum at 9.26. Regarding the between statistics, the standard deviation is 0.51 with a minimum of 6.20 and the maximum of 8.64. The within statistics shows a standard deviation at 0.47, with a minimum of 6.51 and a maximum of 8.79. The above statistics shows that there is enough heterogeneity across the countries taken into discussion and among all the variable is included in the model, so we have decided to use the logarithmic function on the principle variables GDP per capita and health. The new created variables (representing the logarithmic functions of the GDP per capita and public health expenditures) have the significance of elasticity. There are two factors that explains the decision of taking the logarithmic function:

- the first one is related to the fact that the new created series have more appropriated values (on average 10.24 and 7.69, in opposition with 30973 and 2686), that ensured the stability of the new created data;
- the second one is that the elasticity has a more pronounced economic significance that raw variables implied.

The methodology is presented in the following section.

3.2 Methodology

The methodology that we have used is shown in equations (1) and (2), and it is referring to the estimation of nonstationary heterogeneous panels (Blackburne III and Frank, 2007).

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta'_{ij} X_{i,t-j} + \mu_i + \epsilon_{it} \tag{1}$$

$$\Delta y_{it} = \phi_i \left(y_{i,t-1} - \theta'_i X_{it} \right) + \sum_{j=1}^{p-1} \lambda^*_{ij} n \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \delta'^*_{ij} \Delta X_{i,t-j} + \mu_i + \epsilon_{it}, \tag{2}$$

where:
i = 1, 2, . . . , N are the number of groups;
t = 1, 2, . . . , T are the number of periods;
X is a k × 1 vector of explanatory variables;
δ_{it} = it are the k × 1 coefficient vectors;
$(p, q_1, \ldots, q_k)$ are A.R.D.L. lags
ij are scalars;
and i is the group-specific effect.

Regarding the auto-regressive distributive lag model (abbreviated A.R.D.L.), one can see that T must be large enough such that the model can be fitted for each group separately. Time trends and other fixed regressors may be included(λ_{it}). If the variables in (1) are, for example, I(1) and co-integrated, then the error term is an I(0) process for all i. A principal feature of co-integrated variables is their responsiveness to any deviation from long-run equilibrium. This feature implies an error correction model in which the short-run dynamics of the variables in the system are influenced by the deviation from equilibrium. Thus it is common to re-parameterise (1) into the error correction equation (2). Our equation, involving the dependent and independent variables, is presented in equation (3):

$$\Delta lngdpcap_{it} = \alpha_{1i} + \sum_{j=1}^{m-1} \theta_{ij} \Delta lnhealth_{i,t-j} + \sum_{k=0}^{n-1} \mu_{ik} \Delta lngdpcap_{i,t-1} + bECT_{t-1} + e_{1i,t} \quad (3)$$

The results are presented and explained in the following section.

4. RESULTS and DISCUSSIONS

Initially, we have conducted some tests that explain the use of selected methodology. We have used different tests (Levin et al. (2002), Harris and Tzavalis (1999), Breitung and Das (2005)) to determine the stationarity of the series implied. The unit root tests results are available *Appendix*, in table A.1 and in table A.2. The cointegration between GDP and health is also in line with the economic literature e.g.: (Dreger and Reimers, 2005), while the panel data graphic (for every country) testify that series are non-stationary and co-integrated (see A.1) . Taken into consideration the equation (3), the results (Table no. 2) are showing the effects of the health elasticity (log of the variable) to the economic growth (as proxy we have used the GDP per capita elasticity - the log of the variable).

As expected, the error-correction terms are negative and statistically representative at 1% level for both models (mean group, abbreviated as mg and pooled mean group, abbreviated as pmg). The long run coefficient in pmg model is positive (0.764) and statistically significant at 1% level, while in mg model the coefficient is also positive (0.793)

where:
i = 1, 2, . . . , N are the number of groups;
t = 1, 2, . . . , T are the number of periods;
X is a k × 1 vector of explanatory variables;
δ_{it} = it are the k × 1 coefficient vectors;
$(p, q_1, \ldots, q_k)$ are A.R.D.L. lags
ij are scalars;
and i is the group-specific effect.

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As expected, the error-correction terms are negative and statistically representative at 1% level for both models (mean group, abbreviated as mg and pooled mean group, abbreviated as pmg). The long run coefficient in pmg model is positive (0.764) and statistically significant at 1% level, while in mg model the coefficient is also positive (0.793)

Table 2: Impact of the health expenditures on economic growth - logarithmic values

VARIABLES	(1) Model name: pmg Long-run:	(2) Model name: pmg Short-run:	(3) Model name: mg Long-run:	(4) Model name: mg Short-run:
ECT		-0.0846***		-0.134***
		(0.0269)		(0.0270)
D.lnhealth		0.227***		0.211***
		(0.0283)		(0.0332)
lnhealth	0.764***		0.793***	
	(0.0122)		(0.175)	
Constant		0.394***		0.637***
		(0.117)		(0.126)
Observations	700	700	700	700

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

and representative (see Table no. 2). The Hansen test (available on demand) shows that pmg model is a more significant one. The equations shows the positive impact of the health expenditures on economic growth.

The pmg model coefficient can be interpreted as follows: *the increase of the health expenditures elasticity with one unit, positively affects the elasticity of economic growth with 0.764 units*. The results in terms of elasticity are confirmed by the results obtained in raw values (see Table A.3.). The coefficients are also positive and statistically significant at 1% level, suggesting that a raise in health expenditures has a positive impact on economic growth, expressed in GDP per capita. We conclude that there is evidence that quality of health status (which depends directly on the private and public expenditures), is positively associated with economic growth. Our findings are in line with some other studies (e.g. Suhrcke et al. (2006)), that also emphasize the need for: enhancing the quality and availability of data on health, more evaluations of public health interventions, more evidence (empirical studies) on economic impact and favourable returns to interventions (that may be necessary but not sufficient to justify government intervention).

5. CONCLUSIONS

The paper investigates the link between the expanse of the health status and economic development, using as proxies the GDP per capita for economic growth and health expenditures for health. The novelty of the paper is related to the fact that the link between GDP and health is extensively analyzed in literature, but the inverse impact (of the health on growth) that we have analyzed is not so largely treated. Our results, using A.R.D.L. models (mean-group and pooled mean-group as explained in Blackburne III and Frank (2007)) confirm the positive impact of health on development. The results of our study could be useful to policy makers both from national and multinational level, along interested theoreticians. Our study can be a premise for practical support of the policy makers to raise the investments in health and improve the access to health data. The limitation of our study is related to three facts: the limits on the data related to health indicators; fact that our analysis tests the link only between two variables; the time span is relatively narrow. Future studies should take into the consideration more variables and also larger periods of time related to more units (countries).

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Appendix

Figure A.1: Health and Economic Development - logarithmic values

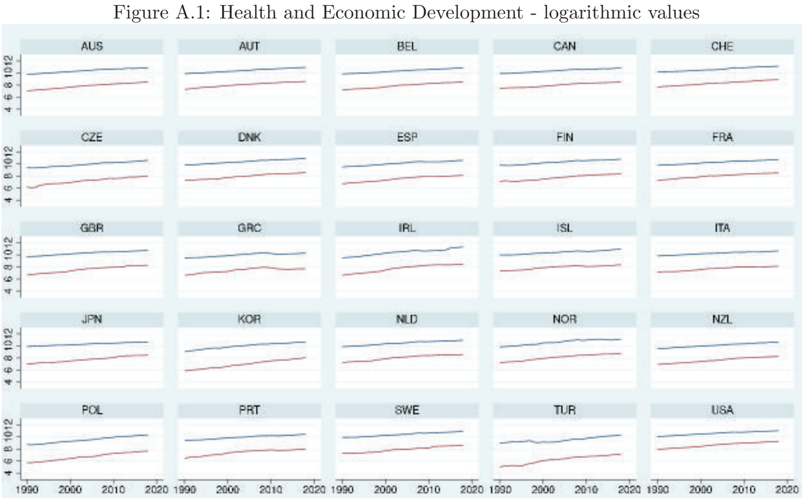

Table A.1: Testing stationarity lngdpcap

Testing stationarity			
Information about the data (panel)			
Data	eufire2020.dta		
Variables name:	lngdpcap		
Number of observations =	725		
Number of panels =	25		
Number of periods =	29		
Test name:	Im-Pesaran-Shin unit-root test		
Null hypothesis:	Ho: All panels contain unit roots		
Alternative hypothesis:	Ha: Some panels are stationary		
Z-t-tilde-bar			
	Statistic	Prob	Conclusion
Level	4.2748	1.0000	H(o)
First-difference	-12.2928	0.0000	Ha
Test name	Levin-Lin-Chu unit-root test		
Null hypothesis:	Ho: All panels contain unit roots		
Alternative hypothesis:	Ha: Some panels are stationary		
*Adjusted t**			
	Statistic	Prob	Conclusion
Level	-4.3490	0.0000	Ha
First-difference	-9.4779	0.0000	Ha
Test name	Harris-Tzavalis unit-root test		
Null hypothesis:	Ho: Panels contain unit roots		
Alternative hypothesis:	Ha: Panels are stationary		
z			
	Statistic	Prob	Conclusion
Level	4.2211	1.0000	H(o)
First-difference	-32.9222	0.0000	Ha
Test name	Breitung unit-root test		
Null hypothesis:	Ho: Panels contain unit roots		
Alternative hypothesis:	Ha: Panels are stationary		
lambda			
	Statistic	Prob	Conclusion
Level	16.7486	1.0000	H(o)
First-difference	-7.7754	0.0000	Ha
Test name	Hadri unit-root test		
Null hypothesis:	Ho: Panels are stationary		
Alternative hypothesis:	Ha: Panels contain unit roots		
z			
	Statistic	Prob	Conclusion
Level	86.3269	0.0000	Ha
First-difference	2.9344	0.0017	Ha

Table A.2: Testing stationarity lnhealth

Testing stationarity			
Information about the data (panel)			
Data	eufire2020.dta		
Variables name:	lnhealth		
Number of observations =	725		
Number of panels =	25		
Number of periods =	29		
Test name:	Im-Pesaran-Shin unit-root test		
Null hypothesis:	Ho: All panels contain unit roots		
Alternative hypothesis:	Ha: Some panels are stationary		
Z-t-tilde-bar			
	Statistic	Prob	Conclusion
Level	-1.4078	0.0796	H(o)
First-difference	-10.8322	0.0000	Ha
Test name	Levin-Lin-Chu unit-root test		
Null hypothesis:	Ho: All panels contain unit roots		
Alternative hypothesis:	Ha: Some panels are stationary		
*Adjusted t**			
	Statistic	Prob	Conclusion
Level	-5.9489	0.0000	Ha
First-difference	-6.2517	0.0000	Ha
Test name	Harris-Tzavalis unit-root test		
Null hypothesis:	Ho: Panels contain unit roots		
Alternative hypothesis:	Ha: Panels are stationary		
z			
	Statistic	Prob	Conclusion
Level	3.6022	0.9998	H(o)
First-difference	-30.1451	0.0000	Ha
Test name	Breitung unit-root test		
Null hypothesis:	Ho: Panels contain unit roots		
Alternative hypothesis:	Ha: Panels are stationary		
lambda			
	Statistic	Prob	Conclusion
Level	15.9471	1.0000	H(o)
First-difference	-8.2438	0.0000	Ha
Test name	Hadri unit-root test		
Null hypothesis:	Ho: Panels are stationary		
Alternative hypothesis:	Ha: Panels contain unit roots		
z			
	Statistic	Prob	Conclusion
Level	86.8404	0.0000	Ha
First-difference	8.7316	0.0000	Ha

Table A.3: Impact of the health expenditures on economic growth - raw values

VARIABLES	(1) Model name: pmg Long-run:	(2) Model name: pmg Short-run:	(3) Model name: mg Long-run:	(4) Model name: mg Short-run:
ECT		-0.0700***		-0.0978***
		(0.0255)		(0.0240)
D.health		3.907***		3.636***
		(0.764)		(0.743)
health	9.881***		7.969**	
	(0.287)		(3.150)	
Constant		938.6***		937.2***
		(130.2)		(196.0)
Observations	700	700	700	700

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1