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Health productivity in macroeconomic level in Turkey: A Multi-level Causality Test approach

Fadime Çınar[1]*, Halil Şengül[2]

[1]Sabahattin Zaim Üniversitesi Sağlık Bilimleri Fakültesi, Sağlık Yönetimi Istanbul, Turkiye

[2]Sabahattin Zaim Üniversitesi Sağlık Bilimleri Fakültesi, Sağlık Yönetimi Istanbul, Turkiye

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Reviewed By: Dr. Daniel V.
Department: Medical

*Corresponding author.
†Email: fadime.cinar@izu.edu.tr.

ABSTRACT

Although private health services have been common, it is known that health is a global public good, and it is related with global public expenditures. Recent studies shoved that productivity in health services is a main domain of government, nongovernmental organizations, and public sector. Thus, increase in productivity of health services provides efficient use of public goods. Moreover, public health services and productivity in health sector is a part of macroeconomic level. In this research, it is aimed to evaluate effects of macroeconomic indicators in health productivity. In the research, data collected from Turkey Statistics Institute (TUIK) for 2001-2016 were used to enlighten macroeconomic indicators and health productivity outcomes. According to results of the study, health expenditures and % in GDP rates are causes for fertility rate ($p<0.05$). Moreover, health expenditures also causes for number of health organizations and number of birth ($p<0.05$). Number of birth causes price level indices ($p<0.05$). All these causality results show that their correlations are positive, since both F statistic level and data observations support positive correlations.

Key words: Health, macroeconomic, productivity

INTRODUCTION:

Increasing communication opportunities and development of globalization have changed concept and borders of health services (Beumer et al, 2018; Hanefeld, 2018; Ravindran, 2014; Schrecker et al, 2008). In the past, health was a manner of local and central governments within countries. On the other hand, globalization and "global public" approach argued that the health is a value of all humanity, and it has been started to taxed as "global public good" (Prentice, 2018; Hyndman and McKillop, 2018; Smith, 2014; London and Schneider, 2012). After this approach had been accepted by managing authorities, role of health services and productivity gained importance for international economic, financial and political areas.

Since health is a public good, it is possible to manipulate health outcomes for political or other objectives (Chemouni, 2018; Schrecker et al, 2008; Kannan and Veazie, 2018; Okada, 2018; Rodriguez, 2018; Rosenberg et al, 2018). In elections, it may be argued that health outcomes are one of the most important factors affecting election results. In other countries having nondemocratic managing system, health outcomes are also important to provide affiliation of citizens. In short, it may be argued that quality and productivity of health services are two main issues of management, and public sector, even there may be a dense private health organizations.

Quality and productivity in health services is not only includes quantitative indicators, but it also includes qualitative aspects. Thus, it has vital importance to define isolated and reliable indicators to evaluate quality and productivity of health services. In this research, it was aimed to examine and define some macroeconomic indicators to evaluate productivity in health sector. Past studies in this area focused on hospital and branch based of other health outcome based analysis. In this research, macroeconomic level productivity in health sector was evaluated.

METHOD:

In the research, data were collected from Turkish Statistical Institute (TUIK) from 2001 to 2016. Collected data were examined. Unit root tests, Agumented fuller tests were used to define unite root tests. Granger causality test was used to define causality relations of variables. EVievs 7 and SPSS 17.0 for windows were used for analysis. All analysis were performed at %95 CI level with an alpha 0.05 significance level.

RESULTS:

Health productivity indicators used in the analysis were given in the Table 1.

Table 1. Health productivity indicators used in the analysis

Year	Health expenditures	%in GDP	Fertility Rate	N of birth	Mean mother age	N of Health Organizations	Inpatient	Outpatient	Bed	Bed per 1000 population
2001	12.395,88	5,10	2,38	1.323.341,00	26,20	10.581,00	1.199,00	9.382,00	140.710,00	2,14
2002	18.773,94	5,20	2,17	1.229.555,00	26,30	9.685,00	1.156,00	8.529,00	164.471,00	2,48
2003	24.278,91	5,20	2,09	1.198.927,00	26,50	9.183,00	1.174,00	8.009,00	165.465,00	2,46
2004	30.020,85	5,20	2,11	1.222.484,00	26,50	9.038,00	1.217,00	7.821,00	166.707,00	2,45
2005	35.358,91	5,20	2,12	1.244.041,00	26,50	8.870,00	1.196,00	7.674,00	170.972,00	2,48
2006	44.068,68	5,60	2,12	1.255.432,00	26,60	9.831,00	1.203,00	8.628,00	174.342,00	2,50
2007	50.904,30	5,80	2,16	1.289.992,00	26,70	11.839,00	1.317,00	10.522,00	178.000,00	2,52
2008	57.740,00	5,80	2,15	1.295.511,00	26,80	13.818,00	1.350,00	12.468,00	183.183,00	2,56
2009	57.910,73	5,80	2,10	1.266.751,00	26,90	15.205,00	1.389,00	13.816,00	188.638,00	2,60
2010	61.677,60	5,30	2,08	1.261.169,00	27,20	26.993,00	1.439,00	25.554,00	200.239,00	2,72
2011	68.607,41	4,90	2,05	1.252.812,00	27,30	27.997,00	1.453,00	26.544,00	194.504,00	2,60
2012	74.188,71	4,70	2,11	1.293.884,00	27,50	29.960,00	1.483,00	28.477,00	200.072,00	2,65
2013	84.390,09	4,70	2,10	1.295.987,00	27,70	30.116,00	1.517,00	28.599,00	202.031,00	2,64
2014	94.749,51	4,60	2,18	1.348.413,00	27,90	30.176,00	1.528,00	28.648,00	206.836,00	2,66
2015	104.567,54	4,50	2,15	1.333.329,00	28,00	30.449,00	1.533,00	28.916,00	209.648,00	2,66
2016	119.755,78	4,60	2,10	1.309.771,00	28,10	32.980,00	1.510,00	31.470,00	217.771,00	2,73

As seen in the Table 1, health expenditures have been increased during evaluated period, whereas % in GDP of health expenditures has been decreased. This means that in a growing economy, health expenditures not increasing parallel to GDP. Number of in and outpatients, bed and birth have increased, but bed per population rate has insignificant changes. Fertility rate and number of birth shows that the population has fewer children than in the past. Overall evaluation shows that health expenditures and number of health organizations have increased, but still there have been some problems in health economy. During 15 year period, a comprehensive improvement must be performed, but there have not been enough improvements. Macroeconomic indicators used in the research were given in the Table2

Table 2. Macroeconomic indicators used in the analysis

Year	Purchasing Power Parity (USA Dollar=1,00)	Price Level Indices (OECD - Total=100)	Per Capita Reel GDP (USA Dollar)
2001	0,41	38,00	9.089,60
2002	0,59	44,00	9.207,89
2003	0,74	50,00	9.490,69
2004	0,79	55,00	10.749,72
2005	0,83	61,00	11.772,99
2006	0,84	59,00	13.497,95
2007	0,85	63,00	14.712,88
2008	0,88	64,00	15.901,08
2009	0,90	57,00	15.330,48
2010	0,92	60,00	17.281,33
2011	0,97	55,00	19.517,18
2012	1,02	56,00	20.549,29
2013	1,07	57,00	22.314,40
2014	1,10	52,00	24.158,81
2015	1,20	50,00	25.111,78
2016	1,30	49,00	25.655,47

Macroeconomic data show that purchasing parity of Turkey has increased during this 15 year period. However, the change is not statistically significant ($p>0.05$). For price level indices, non stable or ordinary distribution has been performed. In other words, price level indices changed unstable structure. Per capita reel GDP rate has a stable and linear distribution in increasing trend. Ganger Causality test results for variables in the research were given in the Table3

Table 3: Ganger Causality test results for variables in the research

Null Hypothesis:	Obs	F-Statistic	Prob.
Health Expenditures % in GDP → Fertility Rate	**14**	**8.51093**	**0.0084**
Fertility Rate →Health Expenditures % in GDP		0.10190	0.9041
Health expenditures →Fertility Rate	**14**	**5.39202**	**0.0289**
Fertility Rate →Health expenditures		0.01614	0.9840
Mean Mother Age →Fertility Rate	14	0.14490	0.8671
Fertility Rate →Mean Mother Age		0.93578	0.4273
Number of Birth →Fertility Rate	14	0.83231	0.4659
Fertility Rate →Number of Birth		3.03059	0.0986
Number of Health Organizations →Fertility Rate	14	2.70686	0.1201
Fertility Rate →Number of Health Organizations		0.11596	0.8918
Per Capita Reel GDP →Fertility Rate	14	0.48143	0.6329
Fertility Rate →Per Capita Reel GDP		3.38585	0.0801
Price Level Indices →Fertility Rate	14	0.03730	0.9635
Fertility Rate →Price Level Indices		0.13492	0.8755
Purchasing Power Parity →Fertility Rate	14	0.05012	0.9514
Fertility Rate →Purchasing Power Parity		2.30106	0.1559
Health expenditures →Health Expenditures % in GDP	14	1.41807	0.2915
Health Expenditures % in GDP →Health expenditures		**5.33751**	**0.0296**
Mean Mother Age →Health Expenditures % in GDP	14	1.86691	0.2098
Health Expenditures % in GDP →Mean Mother Age		0.36609	0.7033
Number of Birth →Health Expenditures % in GDP	14	1.01664	0.3999
Health Expenditures % in GDP →Number of Birth		0.79639	0.4803
Number of Health Organizations →Health Expenditures % in GDP	14	1.67663	0.2405
Health Expenditures % in GDP →Number of Health Organizations		3.81931	0.0630
Per Capita Reel GDP →Health Expenditures % in GDP	14	1.63047	0.2487
Health Expenditures % in GDP →Per Capita Reel GDP		0.32784	0.7287
Price Level Indices →Health Expenditures % in GDP	14	3.67504	0.0681
Health Expenditures % in GDP →Price Level Indices		2.77755	0.1150
Purchasing Power Parity →Health Expenditures % in GDP	14	0.47698	0.6355
Health Expenditures % in GDP →Purchasing Power Parity		0.23900	0.7923
Mean Mother Age →Health expenditures	14	1.77410	0.2241
Health expenditures →Mean Mother Age		1.47679	0.2788
Number of Birth →Health expenditures	14	0.26453	0.7733
Health expenditures →Number of Birth		**5.25150**	**0.0308**
Number of Health Organizations →Health expenditures	14	0.28242	0.7604
Health expenditures →Number of Health Organizations		**18.7983**	**0.0006**
Per Capita Reel GDP →Health expenditures	14	0.45521	0.6482
Health expenditures →Per Capita Reel GDP		2.12775	0.1751
Price Level Indices →Health expenditures	14	2.65354	0.1242
Health expenditures →Price Level Indices		**5.56427**	**0.0267**
Purchasing Power Parity →Health expenditures	14	2.72719	0.1186
Health expenditures →Purchasing Power Parity		**4.74821**	**0.0391**
Number of Birth →Mean Mother Age	14	1.18153	0.3502
Mean Mother Age →Number of Birth		2.03107	0.1871
Number of Health Organizations →Mean Mother Age	14	1.19245	0.3472
Mean Mother Age →Number of Health Organizations		0.60518	0.5668
Per Capita Reel GDP →Mean Mother Age	14	2.77431	0.1152
Mean Mother Age →Per Capita Reel GDP		0.95962	0.4190
Price Level Indices →Mean Mother Age	14	1.57106	0.2599

Mean Mother Age →Price Level Indices		5.64504	**0.0258**
Purchasing Power Parity →Mean Mother Age	14	0.90221	0.4394
Mean Mother Age →Purchasing Power Parity		**7.71924**	**0.0112**
Number of Health Organizations →Number of Birth	14	2.54290	0.1332
Number of Birth →Number of Health Organizations		0.53258	0.6045
Per Capita Reel GDP →Number of Birth	14	3.27830	0.0852
Number of Birth →Per Capita Reel GDP		2.80725	0.1129
Price Level Indices →Number of Birth	14	0.66790	0.5365
Number of Birth →Price Level Indices		**4.75202**	**0.0390**
Purchasing Power Parity →Number of Birth	14	2.39026	0.1470
Number of Birth →Purchasing Power Parity		3.10607	0.0942
Per Capita Reel GDP →Number of Health Organizations	**14**	**4.70646**	**0.0399**
Number of Health Organizations →Per Capita Reel GDP		1.36252	0.3041
Price Level Indices →Number of Health Organizations	14	7.35163	0.0128
Number of Health Organizations →Price Level Indices		**4.68387**	**0.0403**
Purchasing Power Parity → Number of Health Organizations	14	0.78331	0.4857
Number of Health Organizations →Purchasing Power Parity		1.00633	0.4033
Price Level Indices →Per Capita Reel GDP	14	0.16751	0.8483
Per Capita Reel GDP →Price Level Indices		**5.58830**	**0.0264**
Purchasing Power Parity →Per Capita Reel GDP	14	0.81417	0.4731
Per Capita Reel GDP →Purchasing Power Parity		**4.38286**	**0.0469**
Purchasing Power Parity →Price Level Indices	14	4.51230	0.0439
Price Level Indices →Purchasing Power Parity		2.91727	0.1055

According to Table 3, health expenditures and % in GDP rates are causes for fertility rate ($p<0.05$). In addition, health expenditures also causes for number of health organizations and number of birth ($p<0.05$). Number of birth causes price level indices ($p<0.05$). All these causality results show that their correlations are positive, since both F statistic level and data observations support positive correlations.

DISCUSSION:

In this research, it is aimed to evaluate effects of macroeconomic indicators in health productivity. For this aim, data of Turkey during 2001-2016 were examined. In literature, there have been many researches on relationship between economic indicators and health state of the public (Schrecker et al, 2018; Ferreira et al, 2018; Wang et al, 2018; Arora et al, 2017; Tran et al, 2017Verikios et al, 2015). On the other hand, most of these studies focus on individual incomes and economic indicators. In this research, a multiple causality analysis has been performed, in order to enlighten role of health indicators and economic level.

Results of the study showed that health expenditures in Turkey have increased during examined period. Causality test results also showed that health expenditures have positive correlation and causality with fertility rates. In other words, increase in health expenditures causes increase in fertility rate. On the other hand, alternative hypothesis for health expenditure and fertility rate is not statistically significant. This means that health expenditure effects fertility rate, but fertility rate do not have statistically significant effect on health expenditures.

Another important result of the study is that health expenditures causes number of health organizations, whereas number of health organizations does not cause health expenditures. This means that increasing interest on health increases health organizations, but its main trigger is health expenditure increases. Similarly,

health expenditures also cause price level indices and purchasing power parity.

CONCLUSION:

Results of the research shows that increasing health expenditures may be seen as a key factor for improving health sector and public health. In addition, it is seen from the research results that number of health organizations or fertility rate or numbers of births do not have a significant contribution on health expenditures. On the other hand, health expenditures affect these health indicators. As a result, it may be argued that health economy and improvements in health have a strong exogeneity. These exogeneities may include political environment, daily life expectations and routines.

Another important result of the study is that increase in health expenditures also increases fertility rates and number of births. On the other hand, increase in GDP or per capita GDP does not have an effect on fertility and birth rates. All of research results show that health expenditures have a key role in both macroeconomic and health parameters.

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AUTHOR BIOGRAPHY

Fadime Çınar, Sabahattin Zaim Üniversitesi Sağlık Bilimleri Fakültesi, Sağlık Yönetimi Istanbul, Turkiye
Halil Şengül, Sabahattin Zaim Üniversitesi Sağlık Bilimleri Fakültesi, Sağlık Yönetimi Istanbul, Turkiye