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The Relationship between Transfer Health Expenditures and Economic Growth in G-20 Countries:Dumitrescu – Hurlin Panel Causality Analysis

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Abstract: The aim of this study is to investigate the relationship between Per Capita Gross Domestic Product (GDP) and Transfer Health Expenditures (THE) variables for the period of 2000-2017 in the example of G-20 countries (Germany, USA, Argentina, Australia, Brazil, China, Indonesia, France, South Africa, South Korea, India, UK, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia and Turkey) with the most developed economies in the world. For this purpose, Westerlundcointegration test and Pedroni DOLS long-term coefficients were calculated. Dumitrescu-Hurlin Panel Causality method was used in causality analysis. The cointegration test result shows that the dependent and independent variables do not have a long-term cointegration relationship across the panel. According to the panel DOLS test results, THE coefficient results were mostly significant throughout the panel. According to the Dumirescu-Hurlin Panel Causality test results, bidirectional causality was determined between GDP and THE for the panel as a whole. As a result, for the panel in general, the realizations in Transfer Health Expenditures in the long term provide a positive increase in the Per Capita Gross Domestic Product and thus on the level of personal economic welfare.

Keywords: Transfer Health Expenditures, Economic Growth, G-20 Countries, Dumitrescu-Hurlin Panel Causality.
JEL Classification: C50, C51, C12, C33, C60.

1. Introduction

In the 2000s, the expenditures made in the health sector around the world increased proportionally, much faster than the economic growth. When countries are analyzed by high, middle and low income groups, similar trends are observed. Particularly striking data in the 2000s is that public expenditures in health expenditures increased at a faster rate than private expenditures. While the classical discussions in the literature focused on the efficiency, productivity and externality between the public health system and the private health system, the examination of the relationship between the increase in public health expenditures and economic growth in the 2000s revealed important findings. In this study, it is argued that the increase in publicly funded transfer health expenditures supports economic growth.

The Covid 19 Pandemic, which was encountered worldwide in 2020, has led to the re-discussion of health systems. Because the epidemic that is encountered creates an important problem for the whole society. At this stage, the success of the countries' health systems in responding to the epidemic during the epidemic period came to the fore. In many countries, important problems have arisen as the public health system and insurance system necessary for rapid response to cases are not widespread. For example, although the United States of America (USA) is among the countries that spend the most on health services on a global scale, the system had difficulty in providing adequate and fast service during the epidemic period (www.cfr.org). Therefore, it is an indisputable fact how important and necessary the public health system is in cases such as epidemics. Countries with strong public health systems have offered the necessary interventions to large masses of people free of charge.

In this study, it is aimed to determine that transfer health expenditures support economic growth by revealing the relationship between public transfer health expenditures and economic growth of developed countries. Since GDP figures are an indicator of developments in economic growth, it is expected that there will be a relationship between GDP and transfer health expenditures. According to this, some of the public health services are in the form of public hospitals that produce the health service itself or similar health services, public health services etc. while some of it is realized as personal public health expenditures. Personal public health expenditures, medicine, treatment expenditures, etc. Public Transfer Health expenditures constitute the expenditures that are realized in the form of medicine and treatment expenditures made by the Social Security Institutions (SSI), pension fund medicine and treatment expenditures, drug and treatment expenditures, and

green card medicine and treatment expenditures (Yılmaz and Yentürk, 2015: 4). The subject of this study is the relationship between Public Transfer Health Expenditures (THE) and Gross Product Per Capita (GDP).

2. Transfer Health Expenditures in a Changing World

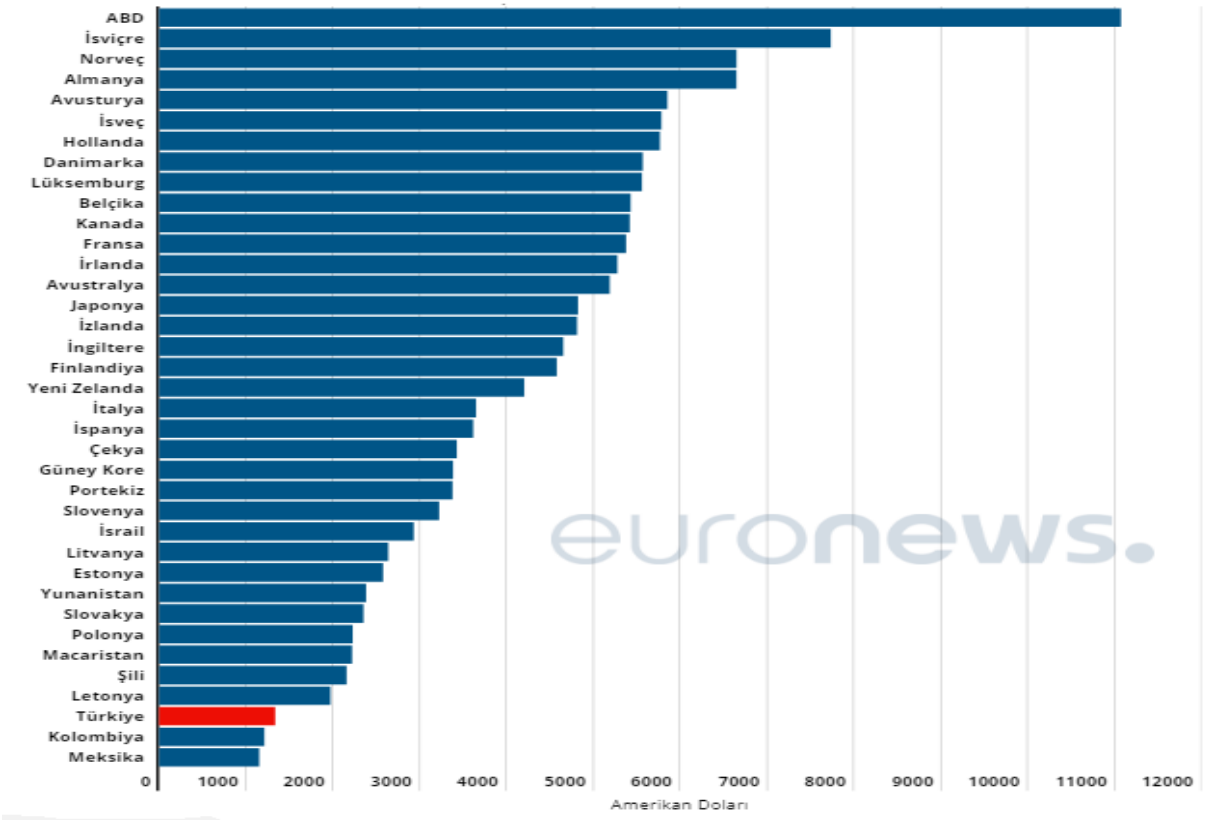
Health service is carried out as a compulsory service for the survival of the human being himself. For this reason, in order for the human being, who is the building block of society, to continue to exist, health services must be offered continuously and at affordable costs. Accordingly, all kinds of expenditures are important in the realization of health services.

In countries where private capital accumulation has not yet accumulated sufficiently, health services are mostly produced by the state. In addition to capital accumulation, serious knowledge, experience, technology, innovation, experience and equipment are needed in order to provide health services. When these reasons are evaluated together, it has been the subject of discussion how to produce health services and how to provide access to health services from past to present. Especially in periods when there was not enough technology, information and equipment, most countries provided health services by the state.

In the "Global Sprending on Health: A World In Transition" report published by the World Health Organization in 2019, noting that the expenditures in the field of health have changed globally, it shows that both private health expenditures and public health expenditures are increasing rapidly. The report reveals that the health sector is growing faster than the economic growth. Between 2000 and 2017, global health expenditures increased by 3.9%, while economic growth remained around 3.0% annually (WHO, 2019).

Therefore, the increase in health expenditures is closely related to capital accumulation and the level of GNP. Looking at country groups around the world, data confirming this determination can be reached. For example, in middle-income countries, health expenditures increased by 6.3% annually between 2000 and 2017, while economic growth rates remained at an annual average of 5.9%. These countries are also rapidly approaching the classification of countries with high expenditure in the field of health. For the same period, it is stated that the average health expenditure per capita in low-income countries is 70 times less than the average health expenditure per capita in high-income countries (WHO: 2019). Therefore, while high-income countries account for 80% of total global health expenditures, middle-income countries account for 19% and low-income countries remain at 01%. These data show that the increase in health expenditures is closely related to the stage of capital accumulation. Because, health expenditures increased from 13% to 19% in middle-income developing countries in the 2000s and started to take a higher share of health expenditures in the world (Yıldırım and Cebeci, 2021: 4).

In Figure 1, a comparative graph of public health expenditures per capita in OECD countries in terms of US dollars, purchasing power parity and current prices for 2019 is given. When public health expenditures per capita in OECD countries are analyzed by country, the United States ranks first with 11071 $, followed by Switzerland with 7732 $, Norway 6646 $ and Germany with 6645 $, although there are problems during the pandemic period. While the average of OECD countries' public sector personal health expenditures is 4222 $, they are at the bottom of the public health expenditures per capita of these countries and well below the average, with Turkey 1337 $, Mexico 1153 $ and Colombia 1212 $. In the Covid 19 Pandemic, where the importance of public sector health expenditures is felt very intensely, the budget shares allocated by countries for health expenditures have come to the fore again (www.euronews.com 2020).



Source: (www.euronews.com 2020).

Figure 1. Health Expenditures Per Capita in OECD Countries

3. Literature Review

In most of the studies investigating the relationship between health expenditures and economic growth in the literature, it is assumed that health expenditures are a function of per capita income. Some of these are the works done by Newhouse (1987), Parkin et al. (1987), Milne and Molana (1991), Gerdtham and Jonsson (1991a), Gerdtham and Jonsson (1991b), Hitiris and Posnett (1992), Güran and Cingi (2002), Şen and Bingöl (2018), Yıldırım and Cebeci (2021). Most studies investigating the performance of health expenditures in time series are actually based on a simple relationship between these two variables. For a long-term relationship, studies by Murthy and Ukpolo (1994), Hansen and King (1996), Blomqvist and Carter (1997), McCoskey and Selden (1998), Gerdtham and Lothgren (2000), Karatzas (2000) and Roberts (2000) can be cited as an example.

McCoskey and Selden (1998) investigated the cointegration relationship between the series by making panel data analysis in their study on the relationship between health expenditures and gross domestic product per capita in OECD countries. Bhargava et al.(2001) argued that the effect of health on economic growth is greater in developing countries than in developed countries in their study using the Dynamic Panel Data Analysis technique. Bloom, et al. (2004) stated that health-related factors have a positive and statistically significant effect on economic growth in their study conducted on panel data of 104 countries using the Nonlinear Two-Stage Least Squares method. Another emphasis is that the improvement in life expectancy creates a positive increase effect. Clemente et al. (2004) studied cointegration analysis and concluded that there is a long-run relationship between total health expenditures and per capita income. Jewell et al. (2003) and Carrion-i-Silvestre (2005) stated that these variables on health and income are structural breaks that affect the level and slope of time series and this can be characterized as stationary processes developing around a broken trend.

Taban (2006) examined the relationship between health and economic growth in Turkey in the context of causality by using the 1980-2000 period data. According to the empirical results, while a two-way causality relationship was observed between life expectancy at birth and economic growth, no causal relationship was found between health expenditures and economic growth. Temiz and Korkmaz(2007) examined the relationship between health and economic growth in Turkey. Johansen cointegration test and Error Correction Model were used within the scope of the analysis. In this study, a positive and bidirectional causality relationship was found between life expectancy at birth and economic growth. A similar study was done by Amponsah-Nketiah(2009)

Granger Causality test on the relationship between economic growth and aggregated expenditures and disaggregated expenditures in Ghana. He concluded that health expenditures as disaggregated expenditure support economic growth, but collective expenditures do not have such an effect.

Çetin and Ecevit (2010) examined the effect of health on economic growth using data from 15 OECD countries for the years 1990-2006. In the analyses, the relationship between health expenditures and economic growth was estimated using the Panel OLS. According to the empirical results, no statistically significant relationship was found between health expenditures and economic growth.

Aghion et al. (2010) estimated the relationship between health and growth in OECD countries with Generalized Least Squares Analysis and Bayesian Analysis. According to the study, health had a significant and positive effect on economic growth between 1940 and 1980, but they concluded that this relationship tended to weaken from 1960 onwards. Ak (2012) stated in his study that there is no short-term relationship, but a long-term causality relationship, as a result of the analyzes made using the Jahansencointegration test and Error correction model for health expenditures, economic growth and life expectancy for the Turkish economy. Alhowaish (2014) examined the relationship between health expenditures and economic growth for Saudi Arabia with the help of Granger Causality test. A one-way causality relationship was found in the study. Accordingly, while positive economic growth led to an increase in health expenditures by 1 percent, health services did not have a significant impact on Saudi economic growth.

Şen and Bingöl (2018) in their study on the relationship between health expenditures and economic growth, worked with quarterly data between 2006-2017 in the case of Turkey. Variance decomposition analyzes with Boostrap-based Toda Yamomato and frequency domain causality tests were studied. They found a bidirectional causality relationship.

4. Econometric Methodology and Practice

In the example of G-20 countries with the most developed and high-income economies in the world (Germany, United States (USA), Argentina, Australia, Brazil, China, Indonesia, France, South Africa, South Korea, India, England, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia and Turkey), the effects of services called Transfer Health Expenditures (THE) on the Gross Domestic Product (GDP) per capita in the country are investigated in order to see the effects on the period before the global Pandemic (covid-19).

In the study, in the example of these countries with the most developed economies in the world, the long-term relationship between the Gross Domestic Product (GDP) per Capita and Transfer Health Expenditures (THE) variables for the period 2000-2017 is investigated. For this purpose, second generation unit root tests, Westerlundcointegration test, Pedroni DOLS and Dumitrescu-Hurlin Panel Causality methods were used in the analysis.

4.1. Dataset and Statistics

The applied panel data analysis was conducted on the twenty most developed "G-20" countries (Germany, USA, Argentina, Australia, Brazil, China, Indonesia, France, South Africa, South Korea, India, UK, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia and Turkey) of the world. The period of 2000-2017 in the time period selection is limited to this period as the time period for which information has been reached. In the study, while Gross Domestic Product Per Capita (GDP) was used as an indicator of economic welfare, Transfer Health Expenditures (THE) data were used as an independent variable. All data were obtained from the official web pages of the World Health Organization (WHO). The information about the variables is as given in Table 1.

Table 1. Variables Used in the Study and Their Explanations

Variables	Abbreviations	Description	Data Source	Period
Gross Domestic Product per Capita	GDP	Dollar $	World Health Organization (WHO)	2000-2017
Transfer Health Expenditures	THE	Dollar $	World Health Organization (WHO)	2000-2017

Source: World Health Organization (WHO), www.who.org. (access: 05.09.2020)

Data sets are prepared in US Dollars based on the base year 2009=100. In order to facilitate the calculations and to prevent deviations from the assumptions, the natural logarithms of the data sets were included in the analysis after they were taken. Descriptive statistics for panel-wide variables are given in Table 2.

Table 2. Descriptive Statistics of Variables

Descriptive Statistics							
	Mean	**Median**	**Max.**	**Min.**	**St.Eror**	**J.B.sts.**	**Probabilty**
LGDP	7.00	6.46	10	5.23	1.11	68.89	0.000
LTHE	2.58	2.57	3.61	0.77	0.73	21.66	0.000

Source: World Health Organization (WHO), www.who.org. (access: 10.05.2020)

The econometric model estimated in this study is as shown in equation (1) below.

$$LKBGSYH_{it} = \alpha_{it} + \beta_1 LTSH_{it} + \varepsilon_{it} \quad (1)$$

Here; i= 1, ……. , N shows the G20 countries in the model data set, that is, the number of sections in the model, and t= 1,……..,T shows the time dimension of the model.

4.2. Horizontal Section Dependency and Homogeneity Tests

In panel data analysis, it is necessary to determine the cross-sectional dependence and homogeneity status of the series before proceeding to the stationarity tests. CDLM1 test developed by Breusch-Pagan (1980) is used when the time (T) dimension of the panel is larger than the cross-section (N) dimension (T>N). In cases where both T and N are large, the CDLM2 test developed by Pesaran (2004) can be applied. In cases where T<N, cross-section dependence between units is investigated with the CDLM test (Cross Section Dependent Test) developed by Pesaran, Ullah and Yagamata (2008) (Hepaktan and Çınar, 2011: 142).

In the study, Pesaran, Ullah and Yagamata (2008) CDLM test was found suitable for the cross-section dependency test, taking into account the T<N feature for the eighteen years (T) and G20 countries (Germany, USA, Argentina, Australia, Brazil, China, Indonesia, France, South Africa, South Korea, India, UK, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia and Turkey) Nineteen cross-section (N) information covering the 2000-2017 period. The CDLM test includes the variance and mean in the test statistic, thus eliminating possible deviations by making both the group mean and the individual mean zero. For this reason, this test is called the deviation-corrected LM test and is expressed as given below (Altıntaş and Mercan, 2015: 359).

$$CD_{LM} = \left(\frac{2}{N(N-1)}\right)^{1/2} \sum_{i=1}^{N-1}\sum_{j=i+1}^{N} \hat{\rho}_{ij}^{\,2} \frac{(T-K-1)\hat{p}_{ij} - \hat{\mu}_{Tij}}{v_{Tij}} \approx N(0,1) \quad (2)$$

For the CDLM test, the null (Ho) hypothesis is "no cross-section dependence", and the alternative hypothesis is "there is cross-section dependence". If it is accepted that there is no cross-section dependence in the panel data set, first-generation unit root tests, on the other hand, using second-generation unit root tests to determine that there is cross-section dependence in the panel data set will provide consistent, effective and robust estimation results.

Another test that should be checked before the analysis is the homogeneity test. The first study on the homogeneity of slope coefficients was done by Swamy (1970). To investigate the homogeneity of the slope parameters of the variables, the homogeneity test (Slope Homogencity Test) developed by Pesaran and Yamagata (2008) is used. In the equation (3) given below, it tests whether the independent variable parameter (β slope coefficient) is homogeneous among the units.

$$Y_{it} = \alpha + \beta_i X_i + \varepsilon_{it} \quad (3)$$

$$\tilde{\Delta} = \sqrt{N}\left(\frac{N^{-1}S - k}{2k}\right) \sim \chi_k^2 \quad (4)$$

$$\tilde{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\bar{S} - k}{v(T,k)}\right) \sim N(0,1) \quad (5)$$

Equation (4) test statistic is used for large samples, while equation (5) test statistic is used for small samples. Here: N shows the number of units, S swamy test statistics, k the number of explanatory variables and v(T,k) standard error (Recepoğlu, Doğanay and Değer, 2020: 74).

Table 3. Cross Section Dependency Test and Results

Horizontal Section Dependency Test				
	GDP		**LTHE**	
	Statistics	**Probability**	**Statistics**	**Probability**
CD_{LM1} (BP, 1980)	2626.847	0.0000***	2021.259	0.0000***
CD_{LM2} (Pesaran,2004)	132.7970	0.0000***	100.0505	0.0000***
CD_{LM} (Pesaran et.al.,2008)	132.2382	0.0000***	99.49172	0.0000***
Bias-Adjusted_CDTest	48.48374	0.0000***	42.45346	0.0000***
Homogeneity Test				
Swamy S Test	chi^2(90)=1100000		Prob> chi^2=0.0000	

Note: "***, **, * signs indicate statistical significance at the 1%, 5% and 10% level, respectively.
When the results of Table 3 are examined, the H0 hypothesis is rejected throughout the panel according to the cross-sectional dependence test results and probability values. There is a cross-section dependence between the series. According to this result, since there is a cross-section dependency, the unit root test should be used.
In the table, the test results of the Swamy-S tests, which were used to investigate homogeneity in second generation estimators, were given as antecedent and lag length of 1. In order to carry out this test, estimation was made by deriving the relevant variables. According to the homogeneity test results, the H0 hypothesis was rejected and the heterogeneity of the parameters was accepted. The most important factor in panel data analysis is heterogeneity. Because the cross-sections in the panel data set may have different properties, that is, the sections may differ in terms of being stationary or non-stationary (cointegrated or not co-integrated) (Asteriou and Hall, 2007: 366).

4.3. Panel Unit Root Tests and Results

Before moving on to the statistical tests of the series with time dimension, it is necessary to investigate the stationarity of the series over time for the data set to be used in model predictions. Unit root tests are used to investigate stationarity.

Pesaran (2007) developed a simple method to eliminate the correlation between units instead of estimating factor loads. Instead of a unit root test based on taking the difference from the estimated common factors, he added the cross-sectional averages of the lagged levels and first differences of the individual series as factors to the DF or ADF regression. Therefore, in this method, the extended version of the ADF regression with delayed cross-sectional means is used, and in this regression, the difference eliminates the correlation between units. This test is called the horizontal section extended Dickey Fuller (CADF) (YerdelenTatoğlu, 2017: 84). The stationarities of the variables were examined with unit root tests, and the results are given in Table 4 below.

Table 4. Unit Root Test

Horizontal Section Extended Dickey Fuller (CADF) Test					
LGDP					
t-bar	cv10	cv5	cv1	z[t-bar]	p-probability
-2.576	-2.100	-2.210	-2.400	-3.616	0.000***
LTHE					
t-bar	cv10	cv5	cv1	z[t-bar]	p-probability
-2.472	-2.100	-2.210	-2.400	-3.171	0.001***

Note: "***, **, * signs indicate statistical significance at the 1%, 5% and 10% level, respectively.

When the results of the horizontal section extended Dickey Fuller (CADF) test are examined, it is seen that the t-bar statistical value for the LGDP variable is greater than the absolute value given at the 90%(cv10), 95%(cv5) and 99%(cv1) confidence levels. According to this result, the series is stationary. According to the probability value of the Z[t-bar] statistic, it is concluded that the series is stationary. Similarly, the calculated t-

bar statistical value of another variable, LTHE, is observed to be greater than the critical values given at 90%(cv10), 95%(cv5) and 99%(cv1) confidence levels. According to this result, the series is stationary. When the probability value of the z[t-bar] statistic is examined, it is concluded that the series is stationary.

4.4. Panel Cointegration Tests and Results

After investigating the stationarity of the series with unit root tests, the Westerlundcointegration test was used in our study to investigate whether there is a long-term reciprocal relationship between the series. Westerlund(2007) worked on four panel cointegration tests with error correction model in order to examine the cointegration relationship between the variables. Of these tests, Gt and Ga give the interpreted group average statistics if the panel is heterogeneous, while Pt and Pa give the interpreted panel statistics if the panel is homogeneous (YerdelenTatoğlu, 2017: 200-203).

In the Westerlund panel cointegration test, Gt and Ga statistics are taken into account if the panel is heterogeneous. In his study, Chang (2004) suggests using resistive probability values in case of cross-sectional dependence between units in the panel data set. In this study, the resistive probability values of Gt and Ga statistics can be examined because the panel is heterogeneous and the series includes cross-sectional dependence (Doğanay, Değer and Recepoğlu, 2020: 77).

Table 5. Results of Cointegration Tests

$$KBGSYH_{it} = \alpha_{it} + \beta_1 TSH_{it} + u_{it}$$

Westerlund Panel Cointegration Test Result

StatisticsValue	z-value	p-value	Robust p-value	
G_t	-1.161	3.097	0.999	0.970
G_a	-6.649	0.444	0.671	0.693
P_t	-3.158	3.228	0.999	0.800
P_a	-2.235	2.015	0.978	0.715

Note: In Westerlund(2007) cointegration test, Ho hypothesis is "No cointegration". The signs ***,**,* indicate statistical significance at the level of 1%, 5% and 10%, respectively. Resistive probability values were obtained with 400 bootstraps..

According to the Westerlund(2007) cointegration test, in which we investigated the relationship between per capita gross domestic product and transfer health expenditure variables, the Ho hypothesis (there is no cointegration relationship between the series) could not be rejected. In the Westerlund panel cointegration test results, no cointegration relationship was found in the hypothesis test results made according to the probability values of the Gt and Ga statistics and according to the probability values of the Pt and Pa statistics. Accordingly, there is no mutual cointegration relationship between the variables. According to these results, per capita gross domestic product and transfer health expenditures are not mutually cointegrated for the twenty most developed countries. It cannot be said that these variables act together in the long run.

Table 6. Panel Dynamic Least Squares (DOLS) Estimated Results

$$KBGSYH_{it} = \alpha_{it} + \beta_1 TSH_{it} + u_{it}$$

COUNTRIES	Transfer health expenses	
	Coefficient	t-statistics
Panel Overall	0.685(32.59)***	
Germany	-6.062	(-3.174)***
USA	5.886	(11.980)***
Argentina	4.306	(3.030)***
Australia	1.206	(7.100)***
Brazil	-1.483	(-9.89)***
Chinese	0.5103	(56.35)***
Indonesia	1.008	(0.797)
France	2.143	(24.80)***

South Africa	0.5137	(8.573)***
South Korea	-1.440	(-15.14)***
India	1.685	(20.77)***
Britain	3.913	(6.686)***
Italy	1.472	(21.10)***
Japan	0.6571	(0.175)
Canada	2.179	(21.33)***
Mexican	-0.9064	(-2.189)**
Russia	-1.170	(-2.137)**
Saudi Arabia	-0.5473	(-4.798)***
Turkey	-0.8548	(-3.294)***

Note: "***, **, * signs indicate statistical significance at the 1%, 5% and 10% level, respectively.

When the panel DOLS test results were evaluated on a panel basis, the sign of LTHE was positive and statistically significant at the 1% level, as expected. In other words, increases in LTHE in the long term affect LGDP positively across the panel. The coefficient across the panel was calculated as 0.68. In other words, a 1% increase in LTHE across G-20 countries will increase LGDP by 0.68%, and the coefficient was found to be statistically significant. This expression is a result provided as a mean group.

When the unit effects of the Panel DOLS test results on the effects of transfer health expenditures on economic growth or economic welfare were examined on the G-20 countries, the results were insignificant for Indonesia and Japan, and the results were statistically significant for the remaining seventeen countries.According to the results given in the table, the coefficients calculated for Germany, Brazil, South Korea, Mexico, Russia, Saudi Arabia and Turkey were found to be negative and statistically significant.According to the result, the increase in LTHE in these countries does not mean that there is an increase in LGDP. In these countries, it can be said that the increase in personal economic welfare or increase in personal income is not positively affected by transfer health expenditures. Again, according to the results in the table, the coefficients for the other ten countries were found to be positive and statistically significant. Accordingly, in the long run, a 1% increase in LTHE in the USA increases LGDP by 5.88%. In Argentina, a 1% increase in LTHE increases LGDP by 4.31%. In Australia, a 1% increase in LTHE increases LGDP by 1.21%. In China, a 1% increase in LTHE increases LGDP by 0.51%. In France, a 1% increase in LTHE increases LKB GDP by 2.14%. In South Africa, a 1% increase in LTHE increases LGDP by 0.51%. In India, a 1% increase in LTHE increases LGDP by 1.68%. In the UK, a 1% increase in LTHE increases LGDP by 3.91%. In Italy, a 1% increase in LTHE increases LGDP by 1.47%. In Canada, a 1% increase in LTHE increases LGDP by 2.18%. When the long-term unit effects are examined, different results and effects may be in question according to the countries.

4.5. Panel Causality Tests and Results

The cross-sectional information of the panel data set requires investigating the heterogeneity between the units for the panel Granger causality analysis (Yıldırım, 2019: 1370). Hoaltz-Eakin et al. (1988) investigated the causality relationship for the panel in general. The Ho null hypothesis is established as there is no causal relationship between the variables over all units.

The long-term relationship between the Per Capita Gross Domestic Product (GDP), and Transfer Health Expenditures (THE) variables and the causality relationship between these variables were investigated throughout the panel.

Table 7. Dumitrescu-Hurlin Panel Causality Test

Dumitrescu-Hurlin Panel Causality Test

Aspect of Causality			W-Statistics	Z-Statistics	Probability	Result
LTHE	→	LGDP	3.8360	8.7412	0.0000***	Cause
LGDP	→	LTHE	2.6660	5.1351	0.0005***	Cause

Note: The signs ***,**,* indicate statistical significance at the level of 1%, 5% and 10%, respectively. The lag length is taken as one.

As seen in Table 6, in DumitrescuHurlin-panel causality analysis, there is causality from LTHE to LGDP and from LGDP to LTHE, according to panel causality results for the overall panel. Therefore, a causal relationship was found between the variables. The causality relationship here is expressed for the panel as a whole. Unit-based causality relation to units Unit coefficients can also be obtained by using heterogeneous VAR analysis.

Result

The aim of this study is to investigate the relationship between Per Capita Gross Domestic Product (GDP) and Transfer Health Expenditures (THE) variables for the period of 2000-2017 in the example of G-20 countries (Germany, USA, Argentina, Australia, Brazil, China, Indonesia, France, South Africa, South Korea, India, UK, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia and Turkey) with the most developed economies in the world. For this purpose, firstly, the horizontal section dependency relationship and homogeneity relationship between the variables were investigated. According to the results obtained, the second generation panel unit root test, CIPS test, was applied and the data set was stabilized. By applying the Westerlundcointegration test, it was concluded that there was no such relationship between the variables. Pedroni DOLS long-term coefficients were calculated, and THE coefficient results were mostly found to be significant across the panel. Dumitrescu-Hurlin Panel Causality method was used in causality analysis. According to the Dumirescu-Hurlin Panel Causality test results, bidirectional causality was determined between GDP and THE for the panel as a whole.

As a result, for the panel in general, the realizations in Transfer Health Expenditures in the long term provide a positive increase in the Gross Product Per Capita and thus on the level of personal economic welfare. Similarly, it can be stated that improvements in Gross Product per Capita provide an increase on Transfer Health Expenditures in the long run. In countries where capital accumulation is not sufficiently formed or private sector services are not sufficient, health services, which are the most basic needs, are provided or supported by the state. Personal health expenditures made in the public sense, medicine, treatment expenditures, etc. Expenditures that are realized in the form of medicine and treatment expenditures made by social security institutions, pension fund medicine and treatment expenditures, drug and treatment expenditures, green card medicine and treatment expenditures are realized as health expenditures that provide social benefits. Personal health expenditures, which are mostly seen as support for low-income groups, have a very serious importance in unexpected or unpredictable epidemic situations such as the Covid 19 pandemic.

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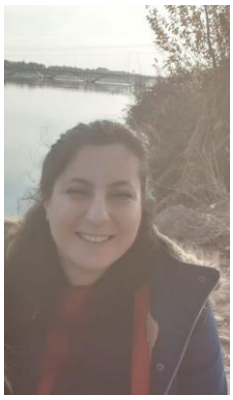

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