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Research Article/Araştırma Makalesi

The Effect of Foreign Direct Investment and Economic Growth on Health: An Empirical Investigation for Türkiye[1]

Doğrudan Yabancı Yatırımın ve İktisadi Büyümenin Sağlık Üzerindeki Etkisi: Türkiye için Ampirik Bir Araştırma

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Abstract

This study aims to investigate the effect of foreign direct investment (FDI) on health for the period of 1975-2018 in Türkiye by using a health production function approach. Life expectancy at birth which is the dependent variable in the study is used as a proxy for the average health status of Turkish citizens. FDI is defined as the ratio of foreign direct investment to GDP. In order to provide optimal estimates of cointegrating relationship, the Fully Modified OLS (FMOLS) developed by Phillips & Hansen (1990) is preferred as the main estimation method, as it allows for endogeneity of explanatory variables. The findings of the study point out that foreign direct investment inflows reduce life expectancy in Türkiye.

Jel Codes: *C50, I15, P45*

Keywords: *Foreign Direct Investment, Economic Growth, Health, Life Expectancy, FMOLS, Health Production Function*

[1]Bu makale Seda KUTLUER'in "Economic Growth, Health and Foreign Direct Investment: An Empirical Investigation for Turkey" isimli doktora tezinden türetilmiştir.

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Öz

Bu çalışma, doğrudan yabancı yatırımın sağlık üzerindeki etkisini 1975-2018 döneminde Türkiye için sağlık üretim fonksiyonu yaklaşımıyla incelemeyi amaçlamıştır. Bu çalışmada, bağımlı değişken olan doğuşta yaşam beklentisi Türk vatandaşlarının ortalama sağlık durumunu göstermek için kullanılmıştır. Doğrudan yabancı yatırımı temsil etmek üzere doğrudan yabancı yatırımın GDP'ye oranı kullanılmıştır. Tahmin yöntemi olarak eşbütünleşme ilişkisinin en iyi tahminini sağlayan Phillips & Hansen (1990) tarafından geliştirilen FMOLS yöntemi açıklayıcı değişkenlerin içselliğine izin verdiği için tercih edilmiştir. Analiz sonucunda doğrudan yabancı yatırım girişlerinin yaşam beklentisini düşürdüğü tespit edilmiştir.

Jel Kodları: *C50, I15, P45*
Anahtar Kelimeler: *Doğrudan Yabancı Yatırım, Büyüme, Sağlık, Yaşam Beklentisi, FMOLS, Sağlık Üretim Fonksiyonu*

1.Introduction

Due to low domestic savings, many developing countries suffer from capital accumulation. Therefore, Foreign Direct Investment (FDI) is seen as essential for developing countries to decrease their insufficient capital accumulation levels. FDI may have a positive effect on the production capacity of the country and stimulate of economic growth by increasing skilled employment level, changing technological structure and enhancing welfare.

On the other hand, health is another important determinant that it has effect on economic growth and development for countries. Since the 1980s, the importance of health has been remarkable for human capital, as indicated in the most growth theories. The capital flow has equally gained importance along with implementation of liberal trade policies during those times. According to many empirical research, FDI inflows positively affect the health status of population as well as the physical capital accumulation in a country. In the literature, there are several studies on this subject using the health production function approach. In many cases, life expectancy at birth, which is the mostly used an indicator of health status, is preferred to measure the effect of FDI flow on health in this study. On the other hand, in some studies, the infant mortality rate has been employed as a proxy of health status. However, life expectancy is accepted as the most essential indicator in the literature. It is clearly seen that higher life expectancy is associated with better health status (Murray & Lopez, 1996). The fact remains that health status is an important factor to attract FDI flows. While good health positively affects FDI, the impact of poor health decreases FDI inflows. Healthy society raises worker productivity and accelerates economic growth, and it attracts more FDI. An improvement in the level of health encourages FDI inflows. A foreign company may have less willingness to invest in a country with a high rate of infectious disease, unhealthy labor, low educated labor, low skilled labor, and low income. A healthy and long-lived society makes the country attractive for foreign investors, so FDI inflows are expected to rise. FDI can also increase labor productivity. Healthy workers are generally more robust than sick people. Therefore, healthier workforce attracts FDI by increasing human capital and total factor productivity. On the other hand, unhealthy labor, morbidity, and mortality rise absenteeism, work turnover, employer's costs and eventually dampen FDI inflows. Nevertheless, there is an endogeneity relationship between FDI and health.

The effect of FDI on health may be both positive and negative. FDI inflows may positively impact health through the income effect. On the other hand, FDI inflows may negatively affect health through infectious diseases, pollution and intensive working effect. FDI may improve health status in the society when it can create economic development effects through improving income distribution, increasing the level of knowledge, reducing environmental problems, increasing the social and cultural welfare of the workforce. However, the positive effect of foreign direct investment on health may not be realized if the development effects are limited. In the literature, this relationship is generally explained by Environmental Kuznets Curve (EKC) Theory. According to this theory, environmental problems and income inequality may increase in the early stages of growth and it may be explained why these positive effects of FDI on health cannot be realized. When FDI inflows occur in developing countries, especially due to insufficient environmental regulations and lower employment costs; it could increase

environmental problems, disrupt income distribution and cause the workforce to work longer working hours for lower wages. In addition, stress and malnutrition can increase due to the intensive working environment. FDI may worsen the ecosystem. Therefore, the market should be regulated by trade necessities such as tax-deductions, bilateral and multilateral trade agreements, and adopting cleaner environmental rules (Kirikkaleli & Adebayo, 2022). United Nation Climate Summit COP27 (Conference of Parties) in Egypt established a new loss and damage fund. The summit highlighted climate commitment of both developed and developing countries. While the demands of developing countries at COP 27 clearly agreed on the creation of a financing mechanism to pay for loss and damage, the developed countries focused on reducing fossil fuel dependence.

There are several studies showing the validity of EKC hypothesis in Türkiye. Sustainable economic growth can be achieved through ecological measurements in the way of development (Adebayo et al., 2023). Environmental-related technologies decrease environmental pollution (Adebayo & Alola, 2023; Adebayo, 2023).

In sum, FDI may have both positive and negative effect on health. While air pollution, intensive working effect, infectious diseases caused by FDI have a negative effect on health, improvement in standard of living by income effect could lead to a positive effect on health. FDI may provide a permanent source for sustainable development for developing countries.

The effect of many variables on life expectancy has been investigated for many times so far, while the studies examining one-way relationship from FDI to health are limited and they include both panel and time series data. In literature, there are a few studies investigating bilateral relationship between FDI and health and only a few of them is based on panel analysis. This study aims to be a unique sample in the literature on economic growth, health and FDI by adopting health production function and using FMOLS, one of single equation cointegration method for analysis and utilizing data for Türkiye.

This study mainly investigates the effect of FDI on health through a health production function approach for Türkiye to fill this gap in the literature. In this regard, firstly, the study adopts health production approach to investigate the nexus of economic growth, health and FDI. Secondly, it uses a single equation cointegration analysis based on a FMOLS methodology which considers the endogeneity issue of the explanatory variables by their nature. In order to check the robustness of the results, two different methods are employed. First one is to change period from 1975 to 2005 to check if the coefficients change significantly. Second one is to apply the other single equation cointegration methods Dynamic Ordinary Least Squares (DOLS) and Canonical Cointegration Regression (CCR).

Firstly, the studies investigating bilateral relationship between FDI and health in the literature are summarized. Secondly, the empirical model based on health production function model is explained. Then, the data set is documented and the econometric methodology and the estimation results are summarized. Additionally, concluding remarks are mentioned, empirical findings are also discussed and some policy implications are proposed. Lastly, some recommendations for future research are proposed.

2. Literature Review

The most common approaches used in health research are health production function, morbidity, morbidity expansion, epidemiologic transition, demographic transition and dynamic equilibrium for treatment process (Binase, 2018). In the health production function approach, economical, demographical, social, physical, environmental, genetic characteristics and the nature of healthcare services and accessibility of health care services are seen as the main inputs in the production process.

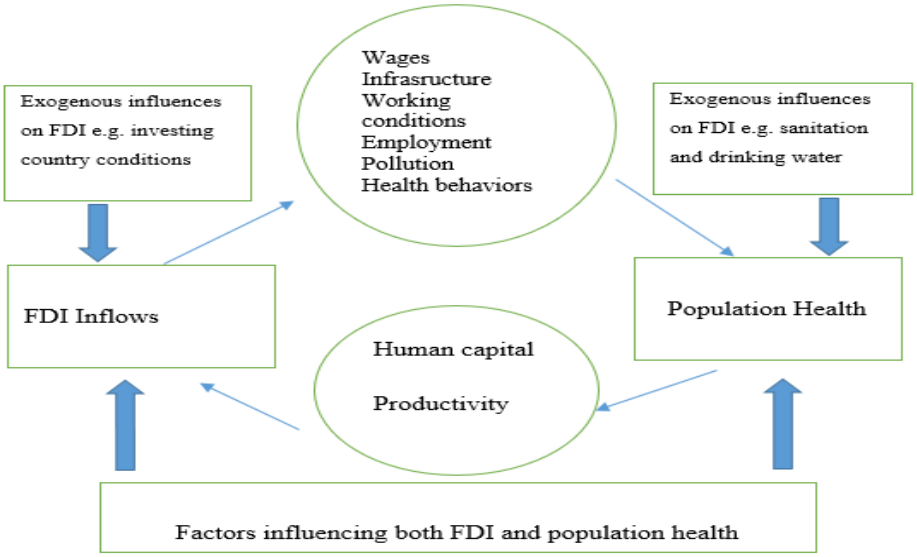
According to Grossman (1972), health enhances labor productivity both directly and indirectly. First, healthy individuals are better educated than unhealthy ones (direct effect). Educated and healthy workers are more productive in their work. Second, a healthy person can spend more time on gainful employment and may be able to work longer hours leading to higher productivity (indirect effect). Moreover, good health enhances creativity and enables the individuals to adopt new technologies easily. Improvement in health develops learning ability as well as increasing skills. As the length of life increases, education investments become more attractive. Healthy labour force becomes more productive and contributes to human capital (Verulava, 2019). The investigation of the relationship between health and FDI could be classified into two categories: effect of FDI on health and impact of health on FDI. Unfortunately, there are limited studies examining the impacts of FDI on health. Some of these studies have revealed positive outcomes (Firebaugh & Becki,1994; Alam et al., 2016; Burns et al., 2017; Lenhert et al., 2013) and while some of them have found negative results (Herzer & Nunnunkamp, 2012; Johnson, 1997; Cao et al., 2017; Steensma & Reiter, 2010; Gökmenoğlu et al., 2018).

There is just one study finding both positive and negative relationships between them (Nagel et al., 2015). It examines the interrelationship between FDI and health for a sample of 179 countries for the period between 1980 and 2011. The findings differ according to income per capita. The coefficient representing the effect is positive at lower income level, and then decreases as the income boosts. It finds that 1% increase in FDI to GDP ratio decreases adult mortality by 0.079% and 1% increase in life expectancy leads to an increase in FDI to GDP by 0.993%.

Note that there is a *mutual association*[4] between FDI and health (Figure 1). There are only a few studies investigating this two-way relationship in literature by executing panel data analysis through instrumental variable approach. In our study, to overcome with endogeneity problem in the econometric application; FMOLS, DOLS and CCR methods are used for estimation where FMOLS being the baseline methodology since these cointegration methods are known to be robust to the endogeneity problem.

[4] "bilateral relationship" or "endogeneity" in econometric terms.

Figure 1: Framework of the Association Between FDI and Population Health



Source: Burns et al. (2017: 74).

There are limited studies investigating bilateral relations between FDI and health. Burns et al. (2017) investigate the relationship of 85 LMICs between 1974 and 2012 by means of panel data. It mentions "endogeneity" which may be resulted from the prospect of FDI and health association is bi-directional. In order to o overcome with misleading results, instrumental variable (IV) regression approach is adopted. Burns et al. (2017) explain this bi-directional relationship by the fact that FDI inflows affect health by wages, infrastructure, working conditions, employment, pollution and health behavior. On the other hand, population health influences FDI inwards through human capital and productivity. Also, there are other several becomes negative at higher levels of income.

FDI increases human capital and also well-educated worker increases FDI inflows in a country. Public policy (i.e. education and training for encouraging human capital) is one of the most important factors in attracting FDI inflows (Michie, 2001). The workers remittance has a positive impact on human capital by transferring their earnings to their home country especially in low-income countries (Azam & Raza, 2016).

FDI contributes to economic growth. Azam & Awan (2022) mentions the environmental and social determinants of health. Environmental pollution leads to a decrease in economic growth (Azam, 2019). Health is the main factor of production. Countries should focus on sustainable development. To improve the health status of the country, governments should focus on investing in green production sectors and also adopt policies that encourage companies which emit low greenhouse gas emissions and improve air quality and control temperature. At this point, Khan et al. (2016) shows an inverted U-shaped relationship between healthcare and expenditures. It is similar to standard Kuznets Curve including the quadratic relationship between income inequality and economic growth.

Table 1: Literature Review

Study	Method	Independent Variable (FDI)	Dependent Variable (Health output)	Effect on Health
Stephens (2016)	Fixed Effect Model	FDI concentration	Life expectancy	Negative
Herzer & Nunnunkamp (2012)	DOLS	FDI	Life expectancy	Negative
Johnson (1997)	Fixed Effect Model	MNC (Multinational corporates) penetration	Infant mortality rate	Negative
Cao et al. (2017)	Fixed Effect Model	FDI	Adjusted life year	Negative
Steensma & Reiter (2010)	Panel linear regression with country fixed effects	Foreign direct investment inward flow	Life expectancy	Negative
Gökmenoğlu et al. (2018)	DOLS	FDI/GDP	Life expectancy	Negative
Nagel et al. (2015)	GMM	FDI per capita	Infant mortality rate	Both positive and negative
Firebaugh & Becki (1994)	Difference of log models	Foreign investment GDP (%), GNP pc	Life expectancy at age 1 women/men	Positive
Alam et al. (2016)	ARDL	FDI	Life expectancy	Positive
Burns et al. (2017)	OLS	FDI	Adult mortality	Positive
Lenhert et al. (2013)	GMM	FDI/GDP	Life expectancy at birth	Positive

Source: Author's Compilation.

"Table 1" shows the studies investigating the impact of FDI on health. The dependent variables differ from the life expectancy which is used in our study. It can be seen that the effect may be negative or positive according to the relevant studies. There are different econometric methods used in international studies. Health production function is used as a theoretical framework to examine the effect of FDI on health. There is no study investigating the relationship between FDI and health for Türkiye. There is a gap in the literature, so this study fills this gap.

3. Empirical Model and Theoretical Background

Analytic framework of a health production function is originated from Grossman's Health Model (1972). It is mainly based on indicators such as financial constraints, time, physical and mental health, social and natural environments.

At the microeconomic level, health is a function of several health status determinants so we can represent it as H=f(X) where H represents health output and X represents vector of health status determinants. The elements of the X vector involve food intake, income, public good consumption, education, time spent at health facilities, initial equipment such as genetics and social equipment such as the environment. In this form, the model developed by Grossman is designed for microeconomic analysis (Fayissa & Gutema, 2005).

Grossman's theoretical health model is a microeconomic model. On the other hand, it can be used for macroeconomic studies by writing the corresponding variables in per capita form. For this purpose, consider the implicit function of h=f(Y, S, V) where it displays health status (i.e., life expectancy at birth etc.), Y is a measure for economic variables per capita (i.e., real GDP per capita etc.), S represents an indicator for social variables per capita (i.e., number of students per teacher in tertiary education etc), V is a vector of environmental factors per capita[5] (i.e., pollution per capita etc).

The model can be explicitly written as follows:

$$h = \lambda \prod_i Y_i^{\alpha_i} \prod_j S_j^{\beta_i} \prod_k V_k^{\gamma_k} \quad (2.1)$$

where αi, βj and γk represent the corresponding elasticies.

According to health production model, the model is constructed as below:

$$H=f(Y, S) \quad (2.2)$$

In this equation, H represents vector of health output, Y is vector of economical variable and S shows social variable.

$$h= f (y_{1,} y_{2,\ldots} y_{n,} s_1, s_{2,\ldots} s_m) \quad (2.3)$$

"n and m" are the number of variables. This can be transformed into the form of where their elasticities are α_i and β_j.

The explicit form is $h=\lambda \Pi\, y_i^{\alpha i} \Pi s_i^{\beta j}$ (2.4)

λ shows initial health stock. To simplify estimation and interpretation, some notations are changed, and the natural logarithmic form of the equation (4.1) is as follows:

$$ln(H)=ln\beta_0+\beta_1 ln(Y)+\beta_2 ln(SCH)+\beta_3 ln(FDI)+\beta_4 ln(EXPN)+\beta_5 ln(TRA) \quad (2.5)$$

In this study we have used three methods: Fully Modified Ordinary Least Square (FMOLS), Canonical Cointegration Regression (CCR) and Dynamic OLS (DOLS). Because of the fact that it is more difficult to estimate the coefficients for five variables, the instrumental variable (IV)

[5] Econometric model for this study does not include any environmental indicator.

method is not preferred for the analysis estimations. Also, it is difficult to find the right tool as an instrumental variable in the econometric model. FMOLS solves the auto-correlation matter by the residuals inside OLS and it enables the analysis to estimate with establishing just one model. FMOLS estimators are consistent, unbiased and have normal distribution.

This study utilizes time series data for the period between 1975 and 2018 for Türkiye. Logarithmic forms are applied to make it smooth and easy to interpret. Life expectancy at birth (H) is used as the health status indicator. Real GDP per capita (Y) is employed as an economical variable and the number of students per teacher in tertiary education (SCH) is the social variable showing quality in tertiary education based on health production function. Furthermore, variables used for the rate of FDI inwards to GDP (FDI), health expenditures per capita (EXPN), the ratio for trade to GDP (TRA) will be elaborately explained in the data section.

4. Data and Methods

4.1. Variables

According to World Bank's definition (WB, 2021), life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same throughout the life. In this study, life expectancy at birth for the total population (years) calculated by the World Bank data center is preferred as a health status measure.

In general, gross flows or net flows are used as common indicators of FDI in the studies. However, we prefer net inflows to GDP from UNCTAD data base for two reasons. Firstly, this measure seems more appropriate for investigating the inwards from foreign businesses to invest in the country (Lenhert et al., 2013; Gökmenoğlu et al., 2018). Secondly, in terms of comparison, it may be a better scale for FDI. It is the net inflows to GDP that matter and not just net inflows. Hence, "the percentage share of each economy/group in the world, and percentage ratios of FDI to GDP" taken from UNCTAD data base is used in this study.

This study includes three control variables of per capita. In accordance with literature, schooling rate and/or school enrollment rate are generally preferred as education variables. However, since these rates are generally obtained by some interpolation methods. This study adopts the number of students per teacher ratio at tertiary education to represent the educational social factor affecting the health status because this ratio can be calculated based on reel observed data without any interpolations. Data for this variable "the number of students per teacher ratio at tertiary education" is preferred in order to represent labor force and take into account institutional factors. Education level is an important determinant on health status. Education (or education level) decreases health problems by increasing awareness about hygiene, preventive cure, drug utilization and health policies. The education data used in this study includes associate degree and bachelor's degree which make the analysis to cover high quality and skilled labor force. It is more accurate to use the number of students per teacher to express the quality of education rather than other enrollment rate series (Avcı & Çalışkan, 2022). Also, this variable is preferred to take into account the

institutional factors. Series for the "number of students per teacher in tertiary education" for the period between 1975 and 2011 is achieved in statistical indicators book (TurkStat, 2012). For the period between 2012 and 2014, the data is taken from the book including formal education statistics (Ministry of National Education, 2017). After 2014, the data is available in The Council of Higher Education (CoHE) statistics database.

Table 2: Data Description

Sign	Variable	Description	Expectation (Expected Directions for Impacts on Life Expectancy)
H	Life Expectancy at birth (Health status indicator)	The number of years a newborn infant would live if prevailing patterns of mortality at the time of birth are to stay the same throughout the life.	The Dependent Variable
Y	RGDP per capita	Real GDP per capita through the method of expenditures based on purchasing power parity.	+, -
SCH	Number of students per teacher at tertiary education	This ratio can be calculated based on reel observed data without any interpolations.	-
FDI	FDI/GDP	The percentage share of each economy/group in the world, and percentage ratios of FDI to GDP in UNCTAD database.	+, -
EXPN	Health Expenditure per capita	Health expenditure per capita through purchasing power parity in OECD database.	+, -
TRA	Trade Openness	The sum of exports and imports divided by GDP from the World Bank as trade openness measure.	+

Source: Author's compilation.

Other control variable is the real GDP per capita which is aimed to reflect economic factors affecting health. This study uses PPP based real GDP to measure the total and per capita output. It is achieved through the method of expenditures based on purchasing power parity. Per capita real GDP is used because the theoretical background for Grossman Health Model needs per capita values of economic variables. Data for real GDP is obtained from World Bank in 2010 US Dollars. Growth may both improve and deteriorate health. In low-income countries, standard of living is an essential part of health. Poor societies cannot afford to buy organic and healthy food all the time, which makes them unhealthier than rich people. High income countries have longer worked hours leading to less social contact and sleep, higher stress and unhealthy food consumption (Lopez-Casasnovas et al., 2005; Granados & Ionides, 2008).

Health expenditure per capita through purchasing power parity in OECD database is used in this study as another control variable for per capita. In general, it is believed that increase in

health care expenditures improve life expectancy. The reason is that health expenditure is an indicator of accessing health facilities since the easier the access, the higher the health care expenditures. On the other hand, there are some results showing negative effects of health expenditure in life expectancy. Out of pocket expenses are the factors affecting reception of health services negatively because it increases costs of endurance (Kılıç & Çalışkan, 2013). There is a study found that FDI inflows affect health expenditures positively in Latin America whereas there is a negative relationship in the Europe, OECD (Erdoğan and Unver, 2015). In statistics, it has seen that there is relationship between FDI and MNC in health care sector. FDI leads market segmentation in health sector especially in the higher income countries. Transnational or Multinational companies contribute local development in the host countries such as Western Europe and Australia (Outreville, 2007).

Although there are many various trade openness criteria adopted by researchers, in terms of comparison to FDI indicator[6], this study employs output criteria that is the sum of exports and imports divided by GDP as trade openness measure. Many studies find that trade openness develops health. It is possible to improve wellbeing by providing growth with reference to some economists. On the other hand, trade may negatively affect health by increasing costs. This effect may change according to trade partners of the country.

5. Results

Firstly, all the variables are turned into the logarithmic forms. FMOLS has a superiority changing least squares to overcome with serial correlation problem and the endogeneity caused by cointegration between the dependent variable and foreign direct investment. Besides, FMOLS estimates have slightly different point estimates, but they have much larger standard errors (Eruygur, 2019). When the explanatory variables which are at the I(0) and I(1) stationarity levels, FMOLS can be used and it presents an efficent result for long term relations determination and have point estimations in contrast to DOLS.

The common specialty of FMOLS is that it is depended on the condition that series are stationary at I(1). Therefore, ADF and Breakpoint Unit Root Test tests were applied and found that all the variables are stationary at I(1).Table 2 presents descriptive statistics.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min.	Max.
LNY	44	8.971.849	0.334198	8.512.987	9.624.238
LNSCH	44	3.156.591	0.342234	2.397.895	3.828.641
LNFDI	44	-0.983346	1.444.674	-4.297.154	1.295.648
LNEXPN	44	5.562.529	1.075.164	3.632.494	7.111.989
LNTRA	44	3.566.831	0.451632	2.208.246	4.096.964
LNH	44	4.207.415	0.100826	4.014.580	4.348.987

[6] FDI/GDP ratio is used to represent FDI inwards.

Source: Eviews 10. **Note:** Log forms of the variables are used.

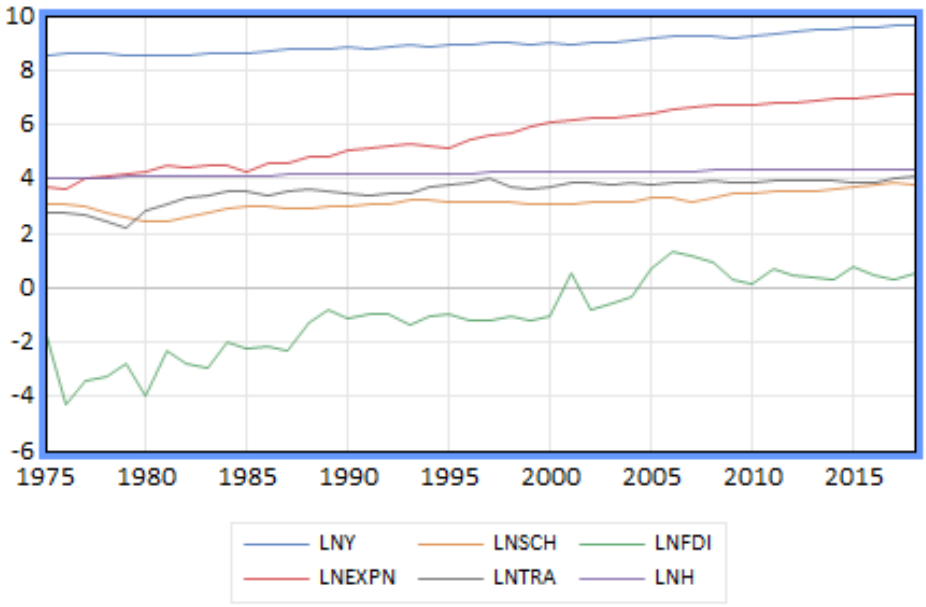
Positive numbers indicate positive correlations, while negative numbers indicate negative correlations. The number closer to 1 (or -1) indicates a stronger correlation. There is a high correlation between the variables (Table 3).

Table 4: Correlation Matrix

Variable	LNEXPN	LNFDI	LNH	LNSCH	LNY	LNTRA
LNEXPN	1	0.912	0.866	0.957	0.771	0.955
LNFDI	0.912	1	0.773	0.819	0.701	0.834
LNH	0.866	0.773	1	0.910	0.816	0.912
LNSCH	0.957	0.819	0.910	1	0.823	0.989
LNY	0.771	0.701	0.816	0.823	1	0.878
LNTRA	0.955	0.834	0.912	0.989	0.878	1

Source: Eviews 10. **Note:** Log forms of the variables are used.

Figure 2: Graph of Variables



Source: Eviews 10.

FMOLS method can be practiced providing that variables are stationary for the first level. If a time series is stationary when its first difference is taken, it is integrated with the first degree which is shown as I(1) .Firstly, the traditional and then structural unitroot test is applied. This study performs structural break unit root tests such as breakpoint unit root tests. The variables are stationary at the significance of %5 level.

Table 5: ADF Unitroot Test Results

Variables	Levels	First Difference
LNY	0.016	-2933***
LNSCH	0.002	-0.630**
LNFDI	-0.112	-1.327***
LNEXPN	-0.016	-1231***
LNTRA	-0.081	-1027***
LNH	-0.011	-0.003**

Source: Eviews 10. **Note:** *, **, *** indicates significant at 0.10, 0.05 and 0.01 level.

Table 6: Breakpoint Unitroot Test Results

Variables	Levels	First Difference
LNY	0.95*	-0.07***
LNSCH	0.898	0.233***
LNFDI	0.604	-0.332***
LNEXPN	0.907	-0.273***
LNTRA	0.713***	0.230***
LNH	0.967	0.755***

Source: Eviews 10. **Note:** *, **, *** indicates significant at 0.10, 0.05 and 0.01 level.

Table 7: Granger Causality Test

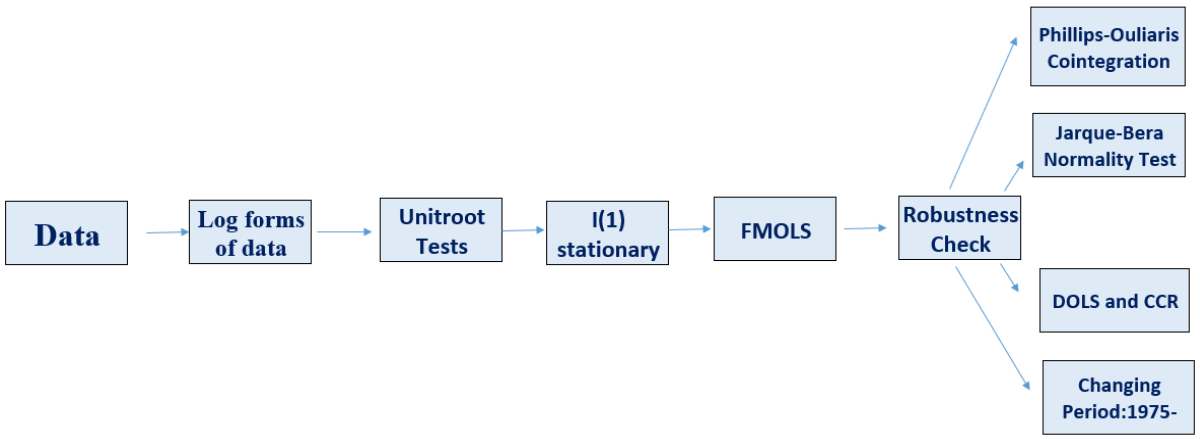
Null Hypothesis	F-Statistics	p-Value
Y does not Granger Cause H	1.302	0.28
SCH does not Granger Cause H	0.407	0.66
FDI does not Granger Cause H	0.169	0.844
EXPN does not Granger Cause H	2.738	0.077
TRA does not Granger Cause H	0.454	0.638

Source: Eviews 10.

The results of the Granger Causality show that null hypothesis is rejected; it means there is causality from Y, SCH, FDI, EXPN and TRA to H. Secondly, the dummy variable is generated for the year 1984 and the afterwards[7]. Since Türkiye has entered a different era in 1984 in terms of openness of the economy. The Central Bank of the Republic of Türkiye calls 1984 and the following years as the years in which the open economic policies have been adopted (Erçel, 1998; Güven, 2008).

[7] The dummy variable is formed as 1 for 1984 and afterwards, before 1984 it is zero.

Figure 3: Flow of the Analysis



Source: Eviews 10.

Analysis results show that dummy variable is significant at 0.05 level of significance.

Table 8: FMOLS Results

Variable	Coefficient	Standard Error	T-Statistic	P Value
LNY	0.050963	0.007791	6.541357	0.0000
LNSCH	-0.015090	0.004188	-3.602759	0.0009
LNFDI	-0.003770	0.000936	-4.026374	0.0003
LNEXPN	0.069733	0.002085	33.45185	0.0000
LNTRA	0.025967	0.002351	11.04741	0.0000
DUMMY	0.032079	0.002389	13.42662	0.0000

Source: Author's Calculations **Note:** LNY: Log form of Real GDP per capita, LNSCH: Log form of Number of students per teacher in tertiary education, LNFDI: Log form of foreign direct investment/GDP, LNTRA: Log form of trade openness, DUMMY: Dummy for 1984.

All the results are at the significance level of 5% unless opposite is stated.

All long-term coefficients of the model is statistically significant. Also, the results for coefficients are compatible with the literature. According to Table 8 showing coefficients, a 1% rise in FDI inflows causes a decrease of approximately 0.004% in life expectancy at birth. In the literature, there are some studies presenting the effect of FDI on health is negative in which the coefficients are smaller than zero (Herzer & Nunnunkamp, 2012; Stephens, 2016; Steensma & Reiter, 2010; Cao et al., 2017; Gökmenoğlu et al., 2018). It is found how much each independent variable is expected to change in order to increase life expectancy by one month. So, average life expectancy in year is turned into month data and then it is calculated according to one-month scale. To increase in the life expectancy by 1 month, the FDI/GDP ratio needs to decrease by 31%. For example, a 31% decrease in this ratio, which is 1.68% for 2018, means a decrease to 1.16%.

The results also demonstrate that; a 1% boost in real GDP per capita leads approximately to a 0.05% increment in life expectancy. This result is consistent with the literature since there has been a consensus among developed countries that life expectancy has reached top point. In

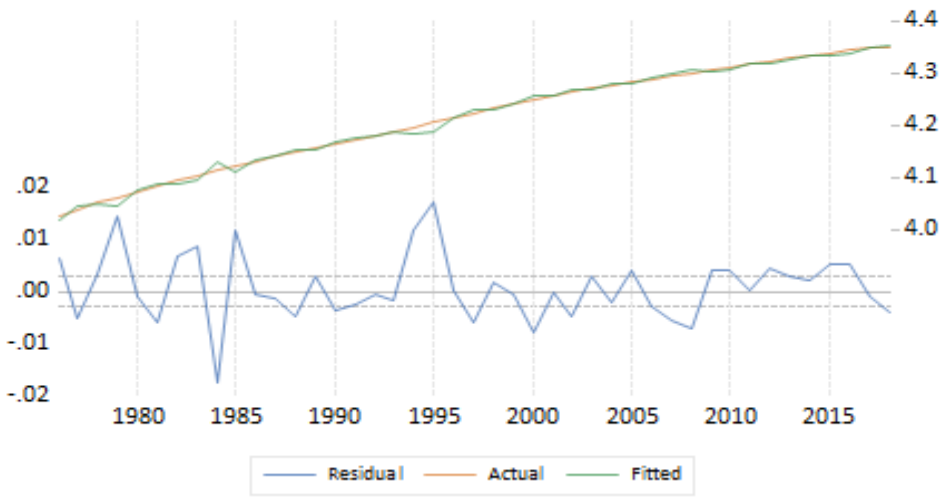
Türkiye, in the last ten years' growth rate of life expectancy is nearly 0.5% yearly (World Bank, 2020). For the life expectancy to increase by 1 month, the real GDP per capita needs to increase by 2.41%.

Another result is related to education where a 1% boost in the number of students per teacher at tertiary education leads approximately to a 0.015% decline in life expectancy. This result is suitable for expectations. It is expected that there is an inverse relationship between the number of students per teacher and life expectancy. It means that improvement in quality in education has improved health. To increase in the life expectancy by 1 month, the number of students per teacher at the university needs to decrease 8.2%.

The result, which states that a 1% increment in health expenditures per capita leads approximately to a 0.07% rise in life expectancy, means that increment in opportunities to access in health facilities make them more accessible for all the public and increase health expenditures. It may be the reason why life expectancy boosts by increase in health expenditures. For the life expectancy to increase by 1 month, health expenditure per capita needs to increase 1.76%.

Lastly, a 1% increase in the ratio of trade to GDP leads approximately to a 0.026% increment in life expectancy. Trade makes possible to reach advanced medical devices and drugs. Hence, it soars life expectancy. To increase in the life expectancy by 1 month, the trade/GDP ratio should increase by 4.7%. For example, an increase of 4.7% in this ratio means an increase from 60.16% to 63% in 2018.

Figure 4: Actual Fitted and Residuals of the FMOLS



Source: Eviews 10.

This graph shows that actual and fitted values are close to each other. It indicates that the estimation values are consistent with the actual values.

5.1. Robustness

After FMOLS, Phillips-Ouliaris cointegration test are employed for FMOLS equation. The null hypothesis states that there is no cointegration. According to our test results, probability values are smaller than 0.05 which signals there is cointegration. Table 9 and 10 show Phillips-Ouliaris cointegration tests results, respectively.

Table 9: Cointegration test: Phillips-Ouliaris

	Value	Probability
Phillips-Ouliaris tau-statistic	-7.411952	0.0006
Phillips-Ouliaris z-statistic	-40.77927	0.0104

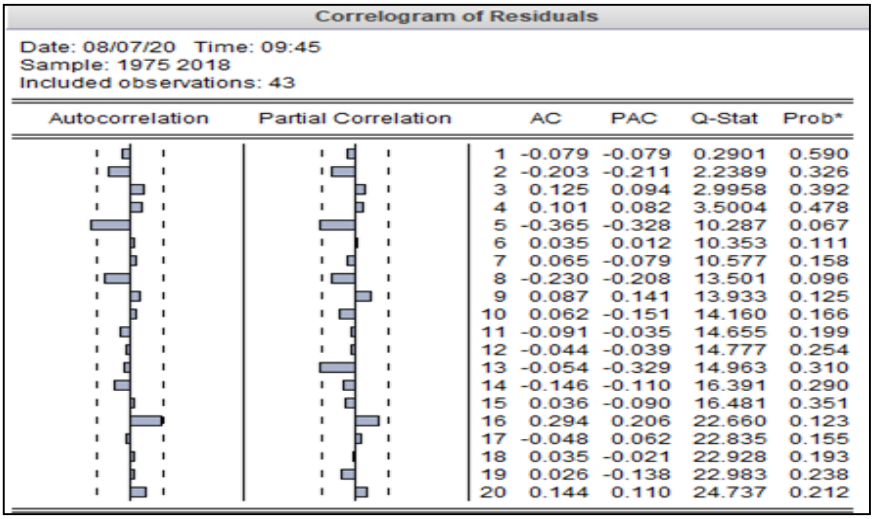
Source: Eviews 10.

Table 10: Phillips-Ouliaris Test Equation

Variable	Coefficient	Standard Error	t-Statistic	Probability
RESID(-1)	-1.092928	0.153770	-7.107541	0.0000

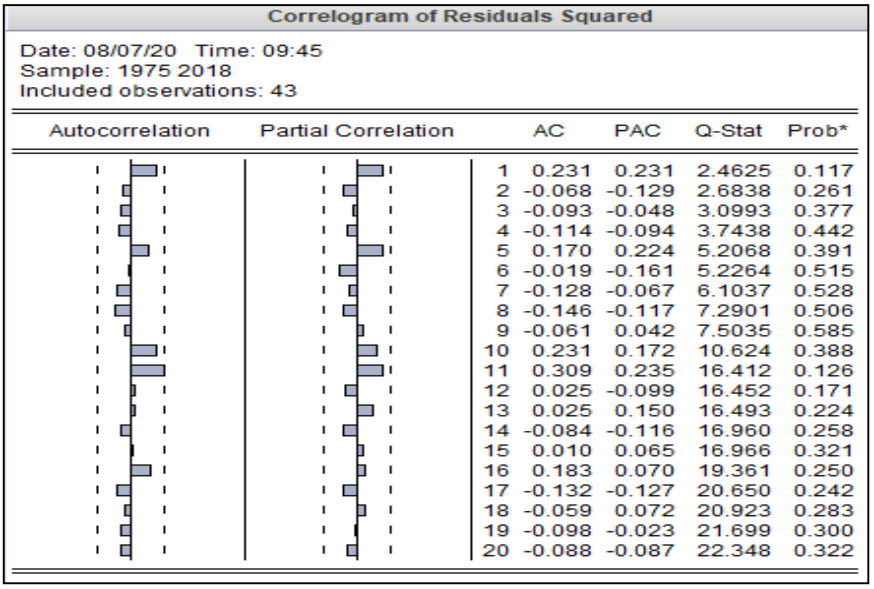
Source: Eviews 10.

Figure 5: Results for Correlogram of Residuals



Source: Eviews 10.

Figure 6: Correlogram of Residuals Squared



Correlogram of Residuals Squared

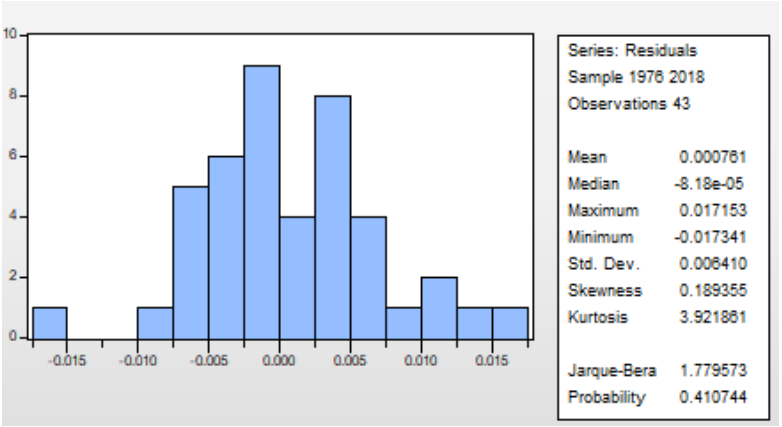
Date: 08/07/20 Time: 09:45
Sample: 1975 2018
Included observations: 43

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.231	0.231	2.4625	0.117
		2	-0.068	-0.129	2.6838	0.261
		3	-0.093	-0.048	3.0993	0.377
		4	-0.114	-0.094	3.7438	0.442
		5	0.170	0.224	5.2068	0.391
		6	-0.019	-0.161	5.2264	0.515
		7	-0.128	-0.067	6.1037	0.528
		8	-0.146	-0.117	7.2901	0.506
		9	-0.061	0.042	7.5035	0.585
		10	0.231	0.172	10.624	0.388
		11	0.309	0.235	16.412	0.126
		12	0.025	-0.099	16.452	0.171
		13	0.025	0.150	16.493	0.224
		14	-0.084	-0.116	16.960	0.258
		15	0.010	0.065	16.966	0.321
		16	0.183	0.070	19.361	0.250
		17	-0.132	-0.127	20.650	0.242
		18	-0.059	0.072	20.923	0.283
		19	-0.098	-0.023	21.699	0.300
		20	-0.088	-0.087	22.348	0.322

Source: Eviews 10.

There is no serial correlation in the analysis (Figure 5 and 6). Jarque-Bera (JB) test is applied for normality in residuals. The null hypothesis states that there is normal distribution between residuals. If p value is more than 0.05, null hypothesis is accepted. As it is seen in the table, residuals have normal distribution (Figure 7).

Figure 7: Jarque-Bera Test



Source: Eviews 10.

In order to check the robustness of analysis, two methods are used; one of is to change the period (1975-2005) and the other one is to execute other single equation cointegration methods such as DOLS and CCR.

Table 11: Results for 1975-2005

1975-2005 (FMOLS)			1975-2018 (FMOLS)		
Variable	**Coefficient**	**Probability**	**Variable**	**Coefficient**	**Probability**
LNY	0.086	0.0000	LNY	0.051	0.0000
LNSCH	-0.024	0.0000	LNSCH	-0.015	0.0009
LNFDI	-0.002	0.0253	LNFDI	-0.004	0.0003
LNEXPN	0.062	0.0000	LNEXPN	0.070	0.0000
LNTRA	0.028	0.0000	LNTRA	0.026	0.0000
DUMMY	0.028	0.0000	DUMMY	0.032	0.0000

Source: Eviews 10. **Note:** LNY: Log form of Real GDP per capita, LNSCH: Log form of Number of students per teacher in tertiary education, LNFDI: Log form of foreign direct investment/GDP, LNTRA: Log form of trade openness, DUMMY: Dummy for 1984.

When the period is restricted between 1975 and 2005, it's seen that coefficients are approximately the same. It implies that the results are not sensitive for changes in the analysis period.

Another robustness check is provided by the other two estimation methods. Results are as follows: probability values for the variable of education indicator[8] are more than 0.05; it is resulted from having higher t-statistics and small variances (between variables) while estimating these coefficients via those methods.

In our study, to overcome with endogeneity problem in the econometric application; FMOLS, DOLS and CCR methods are used for estimation where FMOLS being the baseline methodology since these cointegration methods are known to be robust to the endogeneity problem. FMOLS takes notice of auto-correlation and endogeneity more than other analyses such as DOLS and CCR. It's found that the coefficients by DOLS and CCR are similiar to the FMOLS results. It shows that results are robust which means the results are not affected by changes in theoretically.

Table 12: DOLS and CCR Results

DOLS			CCR		
Variable	**Cficient**	**Probability**	**Variable**	**Coefficient**	**Probability**
LNY	0.047	0.0013	LNY	0.046	0.0007
LNSCH	-0.006	0.5475	LNSCH	-0.007	0.2642
LNFDI	-0.004	0.0160	LNFDI	-0.003	0.0251
LNEXPN	0.069	0.0000	LNEXPN	0.068	0.0000
LNTRA	0.026	0.0011	LNTRA	0.027	0.0000
DUMMY	0.028	0.0000	DUMMY	0.029	0.0000

Source: Eviews 10. **Note:** LNY: Log form of Real GDP per capita, LNSCH: Log form of Number of students per teacher in tertiary education, LNFDI: Log form of foreign direct investment/GDP, LNTRA: Log form of trade openness, DUMMY: Dummy for 1984.

[8] The number of students per teacher in tertiary education.

According to these results, it is observed that the coefficients are not changing significantly when the estimation method is changed (Table 12).

6. Conclusion, Policy Recommendations and Discussion

According to the results, all long-term coefficients of the model are statistically significant. To increase in life expectancy by 1 month in Türkiye, our results suggest as follows for Türkiye: (1) the FDI/GDP ratio needs to decrease by 31%[9], (2) the real GDP per capita is expected to increase by around 2.4%, (3) the number of students per teacher at university needs to decrease by 8.2%, (4) the health expenditure per capita needs to increase by around 1.8%, and finally (5) the trade/GDP ratio should increase by 4.7%[10].

An increase in access to education and higher education quality especially in tertiary education are likely to have positive effects on improving health in a country. This is because education is linked to awareness about hygiene, preventive care, healthy behavior, proper usage of medication and favorable health practices. Trade may improve health by increasing the standard of living and access to medical goods. The increase in trade/GDP ratio, which is the proxy for economic liberalization and the development of medical technology, shows that these factors have positive effects on health. Health expenditures provide an improvement in health in general and, thus, decrease in mortality rates. Especially, new medical technologies, process and innovative pharmaceuticals, health services development (labor and technology intensive) cause people to spend more on healthcare spending in order to prolong their lifespan. Moreover, an increase in access to health facilities by the development of social security systems lead to a rise in usage of health care services and health expenditures. Apart from FDI, these results point out the importance of (1) growth, (2) high quality in tertiary education, (3) easy access to health facilities and (4) free trade policies on health.

The negative effects of foreign direct investment such as stress, less sleep, longer working and malnutrition resulting from intensive working effect may be remarkable in Türkiye. The sectoral division of MNCs in the country is determinant factor for finding out which sector needs to be regulated about wages, working conditions and social security rights. These negative effects caused by FDI can be reduced by increasing wages, achieving better working conditions by legal regulations to improve stress-generating busy work environments in MNCs.

The first element, which distinguishes this study from literature, is to analyze the impact of FDI on health in Türkiye. In international literature, this impact has been investigated by limited number of studies. The studies on the data covering Türkiye commonly research factors that impress life expectancy as a health indicator by using health production function. However, there is no study in which one of the independent variables is FDI for Türkiye when

[9] For Türkiye, this ratio is reported as 1.68% for 2018. Hence a 31% decrease in this ratio implies a decrease from 1.68% to %1.16.

[10] For Türkiye, this ratio is reported as 60.16% for 2018. Hence an increase of 4.7% in this ratio means an increase from 60.16% to 63%.

in the case that life expectancy is the dependent variable. Moreover, the data set this study used is different from the others in international literature. Lastly, FMOLS method which is comparatively new is operated for the analysis. FMOLS is one of the single equations cointegration methods. This study investigates the effect of FDI on health by using both economic and social variable vectors through FMOLS method for the period of 1975-2018 in Türkiye.

The data set in this study also differs from the others. Health indicators are life expectancy at different ages and at birth, mortality rates for infant/under the age of five. However, this study uses life expectancy at birth as health output in accordance with common literature. The variable for environmental indicator isn't used in the health production function. Because of data limitations, it is not possible to use an essential indicator for environmental factors.

We cannot directly compare our results with international studies since many studies use different variables for both dependent and independent variables. As a proxy for health status, many variables such as life expectancy at birth and at different ages, life expectancy by genders, and infant mortality rate are utilized in the literature. An important finding of the study is that an increase in FDI inflows has a negative effect on health status. In fact, this finding can be found in the related empirical literature although the number of studies with similar result is limited (Herzer & Nunnunkamp, 2012; Stephens, 2016; Steensma & Reiter, 2010; Cao et al., 2017; Gökmenoğlu et al., 2018). Although the degree of this impact can change depending on the scope of the study and the countries selected, the coefficient of FDI on life expectancy is generally estimated as small number in literature. According to our estimation results, for Türkiye, a 31% increase in FDI inflows causes one-month decrease in life expectancy. It is compatible with the studies which estimate negative FDI impacts on health in the literature. This result shows that the negative impacts of FDI on health are larger than its positive impacts for Türkiye. However, it is noticed that the figure of impact is quite small. This may imply that it can be turned into a positive effect by implementing some socio-economic policies, pollution decreasing practices and legal regulations on working conditions. The negative effect of FDI on health shows that environmental Kuznets curve hypothesis is valid for Türkiye. One of the reasons is that FDI is mostly based on multinational companies in manufacturing sectors especially in factories and it leads to increase pollution. Especially multinational companies cause to the competitiveness by long working hours, leading malnutrition and stress among the workers in low income countries. All of them affects the health of workers.

Implementation of some specific socio-economic policies aimed at decreasing income inequality caused by income effect also seems to reduce the negative effects of foreign direct investment. As the FDI inflows transferred to productive areas, the share of greenfield investments increases and it provides more employment which contributes to decrease in income inequality. Some tax applications should be put for those multinational companies if it is detected they create pollution in the country. Environmentally friendly practices such as tough environmental taxing and high technological waste systems need to be improved by

companies. Environmentally friendly technology should be promoted to prevent pollution result from MNCs.

The sectoral division of MNCs in the country is determinant factor for finding out which sector needs to be regulated about wages, working conditions and social security rights. So, share of FDI type (especially greenfield investments) could become more important in the country.

For future research, this study can be enlarged to panel data research in order to compare the health status of countries with different social, economic and environmental levels according to the availability of data.

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Çıkar Beyanı: Yazarlar arasında çıkar çatışması yoktur.

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Introduction: 1. author, 2. author

Literature: 1. author, 2. author

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Conclusion: 1. Author, 2. author

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Acronyms

FDI	Foreign Direct Investment
ADF	Augmented Dickey Fuller
CoHE	Council of Higher Education
CCR	Canonical Cointegration Regression
DOLS	Dynamic Ordinary Least Squares
EKC	Environmental Kuznets Curve
EXPN	Per capita Health Expenditures
FDI	Foreign Direct Investment
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
H	Life Expectancy at Birth
HDI	Human Development Index
JB	Jarque-Bera
LMICs	Low- and Middle-Income Countries
MNC	Multinational Corporates
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
SCH	The Number of Students per Teacher at Tertiary Education
TRA	Trade Openness
UNCTAD	The United Nations Conference on Trade and Development
US	United States
Y	Per capita Reel Income