Hacettepe University Graduate School of Social Sciences

Department of Economics

ECONOMIC GROWTH, HEALTH AND FOREIGN DIRECT INVESTMENT: AN EMPIRICAL INVESTIGATION FOR TURKEY

Seda KUTLUER

Ph.D. Dissertation

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ABSTRACT

KUTLUER, Seda. *Economic Growth, Health and Foreign Direct Investment: An Empirical Investigation for Turkey*, Ph.D.Thesis, Ankara, 2021.

This study aims to investigate the effect of foreign direct investment (FDI) on health for the period of 1975-2018 in Turkey by utilizing 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. The other independent variables are (1) the real GDP per capita aimed to represent country's average standards of living and (2) the number of students per teacher at tertiary education which is used to proxy the education quality. Other factors expected to affect the life expectancy in the study include (1) the trade openness (ratio of the sum of exports and imports to GDP) which measures the openness of a country to international trade and (2) the health expenditures per capita to reflect the level of health spending in the country. The Fully Modified OLS (FMOLS) by Phillips and Hansen (1990) to provide optimal estimates of cointegrating relationship is preferred as the estimation method since it allows for endogeneity of explanatory variables. Moreover, the estimation analysis is also enriched by the results of Canonical Cointegrating Regression (CCR) and Stock-Watson Dynamic OLS (DOLS) regressions. The findings of the study point out that foreign direct investment inflows reduce life expectancy in Turkey. Moreover, the results demonstrate that in order to increase life expectancy by one month in Turkey, the FDI / GDP ratio is required to decrease by 31%, the real GDP per capita to increase by 2.41%, the number of students per teacher to decrease by 8.2%, health expenditure per capita to increase by 1.76% and the trade / GDP ratio to increase by 4.7%.

Keywords

Foreign Direct Investment, economic growth, health, life expectancy, FMOLS, health production function.

ÖZET

KUTLUER, Seda. *Ekonomik Büyüme, Sağlık ve Doğrudan Yabancı Yatırım: Türkiye için Ampirik Bir İnceleme,* Doktora Tezi, Ankara, 2021.

Bu tez çalışması, doğrudan yabancı yatırımın sağlık üzerindeki etkisini 1975-2018 döneminde Türkiye için sağlık üretim fonskiyonu yaklaşımıyla incelemeyi amaçlanmaktadır. 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 GSYH'ye oranı kullanılmıştır. Diğer bağımsız değişkenler olarak ülkenin ortalama yaşam standardını temsil etmek için (1) kişi başı reel GSYH ve eğitimin kalitesini gösteren (2) üniversitede öğretim görevlisi başına düşen öğrenci sayısı kullanılmıştır. Bu çalışmada yaşam beklentisini etkilemesi beklenen diğer faktörler bir ülkenin dışa açıklığını ölçen (1) ticari açıklık (ihracat ve ithalat toplamının GSYH'ye oranı) ve ülkede sağlık harcama düzeyini gösteren (2) kişi başı sağlık harcamaları kullanılmıştır. Tahmin yöntemi olarak eşbütünleşme ilişkisinin en iyi tahminini sağlayan Phillips ve Hansen (1990) tarafından geliştirilen FMOLS yöntemi açıklayıcı değişkenlerin içselliğine izin verdiği için tercih edilmiştir. Ampirik analizde yöntem olarak FMOLS seçilmiştir. Ayrıca, tahmin analizi Canonical Eşbütünleşme Regresyonu (CCR) ve Dinamik En Küçük Kareler (DOLS) ile genişletilmiştir. Analiz sonucunda doğrudan yabancı yatırım girişlerinin yaşam beklentisini düşürdüğü tespit edilmiştir. Ayrıca sonuçlar; Türkiye'de yaşam beklentisinin 1 ay artması için FDI/GSYH oranının % 31 azalması, kişi başı reel GSYH'nin % 2.41 artması, üniversitede öğretim görevlisi başına düşen öğrenci sayısının % 8.2 azalması, kişi başı sağlık harcamasının % 1.76 artması ve ticaret/ GSYH oranının % 4.7 artması gerektiğini göstermektedir.

Anahtar Sözcükler

Doğrudan yabancı yatırım, büyüme, sağlık, yaşam beklentisi, FMOLS, sağlık üretim fonksiyonu.

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AIDS: Acquired Immune Deficiency Syndrome

APEC: Asia Pacific Economic Cooperation

ARDL: Autoregressive Distributed Lag

ADF: Augmented Dickey Fuller

BRICS: Brazil, Russia, India, China, South Africa

CCR: Canonical Cointegration Regression

CO: Carbon Monoxide

CO_2: Carbon Dioxide

COVID-19: Corona virus disease-2019

CRTS: Constant Returns to Scale

DF-GLS: Dickey-Fuller Generalized Least Squares

DOLS: Dynamic Ordinary Least Squares

DRTS: Decreasing Returns to Scale

EKC: Environmental Kuznets Curve

EU: European Union

EXPN: Per capita Health Expenditures

FDI: Foreign Direct Investment

FMOLS: Fully Modified Ordinary Least Squares

GDP: Gross Domestic Product

GMM: Generalized Moments Method

GSYH: Gayrisafi Yurt içi Hasıla

H: Life Expectancy at Birth

HDI: Human Development Index

HEI: Higher Education Institution

HIV: Human Immunodeficiency Virus

JB: Jarque-Bera

KPSS: Kwiatkowski-Phillips-Schmidt-Shin

LMICs: Low and Middle Income Countries

MNC: Multinational Corporates

MNE: Multinational Enterprises

OECD: Organisation for Economic Co-operation and Development

OLG: Overlapping Generation

OLS: Ordinary Least Squares

PM10: Particulate Matter

PP: Phillips-Perron

R&D: Research and Development

SCH: The Number of Students per Teacher at Tertiary Education

TFP: Total Factor Productivity

TRA: Trade Openness

UNCTAD: The United Nations Conference on Trade and Development

US: United States

VAR: Vector Auto Regressive

Y: Per capita Reel Income

INTRODUCTION

Foreign direct investment (FDI) is seen essential for developing countries to meet the capital need since they have low level of savings. Also, FDI has a positive influence on capital accumulation and production capacity of the country, affects economic growth, employment level, technological structure and enhances the welfare.

Health is important for the countries in the process of growth and development. Since the 1980s, the importance of health has been remarkable for human capital in the growth theories. The capital flow has gained importance with liberal trade policies. FDI inflows affect health as well as the increase in physical capital. In the literature, there are several studies on this subject use the health production function approach. According to this approach, health output indicators reflecting the health system capacities, which are the number of hospital beds and the number of physicians/nurses, are defined as the function of health inputs. Life expectancy at birth, which is the most used health output indicator, is preferred in this study. The reason of studying this subject is that health is an important component of human capital. Health affects productivity positively by increasing productivity.

There is an endogeneity relationship between FDI and health. FDI may improve health status in the society when it can create economic development effects such as 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, it is explained by Environmental Kuznets Curve (EKC) Theory. According to it, 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 low-cost workforce; it can

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 conditions. In sum, FDI may affect health both positively and negatively. While pollution, intensive working effect, infectious diseases caused by FDI are going to have negative effects, improvement in life standards by income effect could lead to a positive effect on health.

Even though there are abundant research[1] on the effect of different variables on life expectancy, studies examining unidirectional relationship from FDI to health exist in limited numbers using with both panel and/or time series data. On the other hand, there are quite few studies investigating the *bilateral* relationship between FDI and health and they are generally based on panel data analysis. FDI may provide a permanent source for sustainable development for developing countries. In this regard, this thesis mainly investigates the effect of FDI on health through a health production function approach for Turkey in order to fill this gap in the literature. To represent FDI, the amount of FDI inwards over GDP share is used. The real GDP per capita is used to represent country's average standards of living and the number of students per teacher at tertiary education is adopted to proxy the education quality in the country. In addition, the factors that determine life expectancy such as trade openness (ratio of the sum of exports and imports to GDP) and health expenditures per capita are included in the analysis as other necessary control variables.

This study aims to be unique for two reasons. First, it adopts health production approach to investigate the nexus of economic growth, health and FDI. Second, it uses a single equation cointegration analysis based on a FMOLS methodology which takes into account the endogeneity issue of the explanatory

[1] See, for example, Gilligan and Skrepnek (2015), Delavari et al. (2008), Lin et al. (2012) and Zhao et al. (2013) etc.

variables by their nature. In order to check robustness of the analysis, two different methods will be executed. First one is to change time period from 1975 to 2005) to check if the coefficients changes a lot. Second one is that the other single equation cointegration methods Dynamic Ordinary Least Squares (DOLS) and Canonical Cointegration Regression (CCR) will also be used .

In the existing literature, health production function also involves economic, social and environmental factors. As envionmental indicator, there is not an efficient indicator for the period this study covers, In the literature, CO2 emissions are used as an indicator for urbanization, industrialization and environmental pollution. However, the amount of particulate matter in the air is the most appropriate indicator for investigating the relationship between health and pollution. Because of data limitations, environmental factors are not prefered to use in this study.

This study includes two control variables of that kind. 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. Other control variable of that kind is the real GDP per capita which is aimed to reflect economic factors affecting health. In our study, the reel GDP per capita based on purchasing power parity (PPP) is preferred. This method converts GDP into international dollars using purchasing power parity rates and this international dollar has the same purchasing power over GDP as the U.S. dollar has in the USA.

This thesis is comprised of five chapters. In the first chapter, the concept of growth and development is defined and evaluated based on primary and modern growth theories. In the second chapter, concept of FDI, its importance

on growth in the field of development and lastly legislative framework, sectoral and geographical distribution of FDI in Turkey is explained. In the third chapter, health production function model is discussed using the Grossman Health Model (1972) and the importance of health on growth in development path is also explained. Furthermore, the studies investigating bilateral relationship between FDI and health in the literature is summarized and impacts of some other explanatory variables on health is surveyed. The fourth chapter explains the empirical model and reports the estimation results. In this chapter, the data set is documented and the steps of econometric methodology together with the estimation results are summarized. Detailed software outputs for estimations are given in the appendix after bibliography.

The last chapter is devoted to concluding remarks. In this last chapter, empirical findings are discussed and some policy implications are proposed. Lastly, some recommendations for future research are proposed.

CHAPTER 1:

ECONOMIC GROWTH AND GROWTH THEORIES

1.1. ECONOMIC GROWTH AND DEVELOPMENT

Economic growth is an increase in material output per capita (Berg, 2017). Development is an overly complex and all-inclusive statement. There are many factors affecting the development level of the countries. The concept of development is first described as the way of increasing the quality of human life which includes better income level, education opportunities, health and nutrition conditions, less poverty, cleaner environment, more equal opportunities, increasing individual freedoms and wide cultural life (World Bank Report, 1991). Economic growth and development are different but connected economic events. Therefore, they are sometimes used interchangeably. Both are at the top of the agenda in global due to the gap between developed and developing countries in today's world. In this regard, Berg (2017) defines economic development as:

> "A full range of changes in humanity's economic, social and natural environment that are perceived by people as making life more pleasant and satisfying."

Not every economic change indicates the existence of development. However, every development may lead to economic growth only in the long term because increase in the amount and the quality of workforce, physical and human capital, natural resources and technology can occur in the long period (Kibritçioğlu, 1998). At this point, the stability of the economic growth gains importance. If there is economic growth which is at a steady level for a long time, it yields development. On the other hand, one of the important things is to achieve sustainable economic growth. Sustainability in economy is realized by providing

stability in price, macroeconomic indicators and a growth rate close to the potential level permanently (Han and Kaya, 2004).

In recent years, OECD adds a new concept for growth called inclusive growth and defines it as fair distribution across society and the creation of opportunities for all. As it has come out, growth is a very far-reaching concept which needs to be evaluated in the field of development. Theories for growth and development are intertwined since the conditions in developed countries are taken into consideration during the process of preparing growth theories and models.

In the following subtitle of this section, perspectives of different theories on economic growth will be discussed. Before that, the main elements of growth and the funding of development will be mentioned.

1.2. THE DETERMINANTS OF ECONOMIC GROWTH AND THE SOURCE OF DEVELOPMENT

The main elements of economic growth are seen as physical capital, labor, technological change and natural resources in the growth theory. Many economists argue that the outstanding features in successful economies are high accumulation of both capital types and continuous technological progress. The following implicit function displays economic growth.

$$Y = F(\Delta K, \Delta L, \Delta N, \Delta A) \qquad (1.1)$$

Economic growth can be expressed by increasing the function of labor (L), natural sources (N), capital stock (K) and technology (A). Natural resources are generally constant since land area is limited. However, labor force constantly increases in parallel with population growth rate. Therefore, the land-labor ratio decreases over time. In this case, growth is only possible by increasing the production per labor force via a rise in the capital-labor ratio. Hence, capital-output ratio is the development rate indicator. This ratio shows how much of the gross national product obtained each year will be allocated for investments, in

other words it represents the need for capital (Han and Kaya, 2004, p. 275). However, it is not possible to explain the facts for economic growth with four basic economic variables of the classicals under recent economy world (Grooteart, 1998, p. 1). Because it is not enough to state the reasons for not being developed with only lack of physical capital. Therefore, new endogenous growth models include both intangible and physical factors and expand the definition for capital by counting in political, rational, environmental, intellectual, cursive, human, scientific, technological and social elements.

There has been a sharp increase in growth in the last twentieth century. Growth changes consumption patterns which lead a structural change in several sectors such as services, transportation and production facilities. Economic growth process is a structural change in almost all aspects of consumption and production. If output grows faster than population, it indicates the economic growth (Kuznets, 1966; North and Thomas, 1973). If some part of the population cannot benefit from increase in income, it is called “growth without development”. The main purpose of development is not to include only material sense, but also labor force in high quality to sustain wealth. Development involves fair income distribution, high income per capita and high quality of life which can be determined by factors to be found in an index displaying the quality of life: literacy, average life expectancy, calorie consumption per person, infant mortality rate, population per doctor, health expenditure per person, education expenditure per person (Kaynak, 2011, p. 85-86). Among them, most importantly, well-educated and healthy population serve effective usage of resources for economic development.

Another discussion is the boundaries of economic growth. Factors that determine and limit economic growth are population, agricultural production, natural resources, industrial production and environmental pollution. It is inevitable that continuous growth and mutual interactions between these elements may lead the end of the world, if it is not controlled (Meadows and

Medows, 1978). It may be called the cost of growth. In this regard, development funding matter comes the agenda.

The funding of development depends on both domestic and foreign sources in modern economic structure. In general, domestic sources comprise domestic savings, inflation and taxes especially for underdeveloped countries. Foreign sources are FDI, investment funds brought from abroad, foreign debts borrowed as foreign currency provided by the national economy through the government or private institutions and lastly foreign aid (Şen et al., 2011, p. 230). Among them, the most permanent and sustainable source is FDI.

FDI inflows are evaluated as the source of financing current account deficits in a country. FDI has significance for growth in developing countries since it has many advantages on employment, growth and development (Hang, 2005). They have a direct effect on growth by increasing physical capital and productivity (Durgan, 2016, p. 22). In contrary to the other types of saving sources, it is permanent, and its benefits are long term. It is regarded the essential factor improving growth in our country. Both developed and developing countries make efforts to attract FDI. They also compete to promote the economic development. Since 1990s, The United Nations Conference on Trade and Development (UNCTAD) has put incentives for FDI. As stated above, health is evaluated as an integral part of development (United Nations, 1980, p. 95). Many studies support it by demonstrating the significance of health for being the main element of human capital (Alsan et al., 2006). However, health is largely ignored by policy makers competing for FDI so far. Furthermore, little attention has been devoted to the impact of FDI on health in the existing literature although health is a part of development. That is why the main research question of this thesis is how FDI affects health output. It is expected to make several suggestions for both academic interests and main policy implementations. At this point, next section will include growth theories. Second chapter will include FDI and economic growth, then empirical literature section will demonstrate FDI-health relationship.

1.3. GROWTH THEORIES

The purpose of growth theories is to explain the factors that determine growth rate within a country and display the reasons for differences in growth rates in the world economy. Firstly, the pioneering theories will be explained, and then modern growth theories will be summarized.

1.3.1. Pioneering Theories

Growth theories in historical evolution path will be respectively addressed by starting from Mercantilism, Physiocrats, the Classicals and Marxism.

Mercantilism was originated in Europe between 15th and 18th century. It is a set of doctrines and practices that required the achievement of a satisfactory balance of trade so that national states could accumulate gold and silver in the country (Gomes, 1987, p. 102). The main target in mercantilism is to prevent precious metals in the country from going abroad. Imports must be restricted to ensure surplus of exports. A country, which has a trade surplus, is enriched by limiting foreign trade and liberalizing domestic trade. The state has a right to interfere economy. High population, strong army and precious metals are indicators showing the state's strength. The more precious mine in a country, the richer it is. According to the mercantilism, a government should encourage protectionism and manufacturers, the national economic union is adopted, precious metals are the source of wealth, goods are exported, wealth of the world is stagnant and one's gain equals another's loss. The most important element of this period is trade and trade surplus. Industrialists, traders and bankers are in an important position in class system. At the end of the Middle Ages, there was a flow of precious metals from Europe to other countries, so there was an unavoidable price increase in Europe. Increasing colonialism brought capital accumulation (Seyidoğlu, 2003, p. 14).

Physiocrats are the first to criticize Mercantilists. Physiocrats believe that life is arranged by the nature. The advocates of this view accept that the market reaches its own balance somehow. Economic surplus is comprised by profit getting from agriculture. Success comes from agriculture not from traders. According to them, foreign trade can only be profitable in the short run. They argue that state should not intervene in an economy (Özgüven, 1988).

The Classical theory begins with the Wealth of Nations, in which Adam Smith explains international trade scientifically for the first time. Smith's views are the opposite of protectionist trade policies of mercantilism. The Classicals claim that economic individuals are homo economicus; there is "laissez faire laissez passer" and "invisible hand" in the market. Natural price is explained in such a view that prices of all tradable goods sometimes tend to go upside and down; however, it is continuous to turn into the balance point. Long-term equilibrium is the understanding that natural prices are equal to market prices and the rate of uniform profit in the economy is realized. High profit target is the main reason of capital movement. Labor theory of value declares that labor creates capital, and the value of capital goods is measured by the labor that produces them. Smith advocates benefits of specialism and division of labor. There is also mutual gain in international trade (Seyidoğlu, 2003, p. 16).

According to the absolute advantages by Smith, foreign trade for any country is advantageous for the goods that cannot be produced at home country or those that are more expensive than abroad. Ricardo advances this theorem and finds out comparative advantages which claim to trade goods having international competitive advantage (Kibritçioğlu, 1994). Ricardo adopts natural price and aims to ignore temporary deviations. Price of tradable good converges into about its natural price. On the other hand, Malthussian theory is another important part of classicals. Malthus' growth theory is based on two basic assumptions: there is the law of decreasing returns in the agricultural sector and income has a positive effect on population growth rate. It means that birth rates

and population growth will be positively affected by better health status, improvements in life standards and nutritional needs when income increases.

Marx discusses production price which is the same as natural price. Balance occurs by fluctuating between daily market prices. Marxism claims that growth realizes by capital accumulation which realizes through surplus in production turning into capital. Labor productivity has the trigger effect on capital accumulation. A nation's wealth should be measured by relative surplus in production, not by absolute values. Total surplus value is comprised by the degree of exploitation of labor force(Marx, 1977).

1.3.2. Modern Growth Theories

Modern growth theories process was initiated by Ramsey (1928). In the second half of the nineteenth century, Harrod and Domar made some contributions for Keynesian static theory. Then, Solow expanded neoclassical production function with constant and decreasing returns to scale in 1950s. Neoclassical growth model was extended by adding human capital over the years. After that, endogenous growth models explained that growth could be internalized in the process.

1.3.2.1. Keynesian (Harrod-Domar) Model

Harrod and Domar integrated Keynesian analysis with economic growth and called it Harrod-Domar Model (Barro and Martin, 2004, p. 17). Firstly, they both developed the theory independently from each other, linking the growth rate of a country with the capital stock. While Keynes emphasized on total demand through investments, they argued whether investments increase the productive capacity of the economy. The Harrod-Domar model confirms the primary importance of capital accumulation (Snowdon and Vane, 2005, p. 530). According to Harrod-Domar model; when the ratio for capital to labor is constant, there is neutral technological development, meaning that the

investments increase the productivity of the labor (Barro and Martin, 2004, p. 52).

In the last half of the twentieth century, this model was sufficient to explain the key development strategies. Since the growth rate was positively related to the saving rate, underdeveloped economies focused on how to increase private savings rates in the 1950s to ensure that they achieve a self-sustaining growth path (Bhagwati, 1984)

Harrod defines the sum of labor supply growth rate and technological development rate as natural growth rate. In this case, equilibrium is achieved in both good and labor markets simultaneously. This is called the golden rule. At the steady level, growth rate is equal to the capital accumulation rate. The main problem is whether entrepreneurs could make good demand forecast and appropriate investment decision. Hence, it is difficult for the system to balance. It is called the “knife-edge equilibrium” (Ünsal, 2016, p. 102). Kaynak (2009) explains it as unstable equilibrium. This issue, which can be described as the weakness of the model, stems from the assumption that there is zero substitution between labor and capital (Snowdon and Vane, 2005, p. 533). Neoclassical growth model advocates stable equilibrium that makes it turning point for growth model theories. Hence, starting with neoclassicals till the endogenous growth theories, the way how to reach the equilibrium will be the main matter to be solved instead of achieving it.

1.3.2.2. Neoclassical Growth Model

Neoclassical view focuses on how to achieve efficient resource allocation and identifies static conceptual framework. Neoclassical growth model assumes a closed economy, saving-investment identity, competitive market structure, rational economic actors, decreasing returns to scale for capital and labor, constant returns to scale for technology (Özsağır, 2008, p. 6). Capital has referred only physical capital since human capital gets involved with the

extended model. By this way, physical capital includes all production tools required by the labor factor to engage in production activity. It can be sorted as machinery, equipment and building. In addition, at the macro level, it is considered that all the investments for transportation including road, railway and airline, infrastructure investments for electricity production and FDI are accepted as part of the physical capital since it puts up economic growth. Growth rate of the physical capital stock with investments depends on the volume of the existing physical capital stock.

Solow growth model includes variables which are output (Y), capital (K), labor (L) and technology (A).

$$Y = AF(K, L) \tag{1.2}$$

Solow Growth Model, which displays how saving, population growth and technological development impress the increase in output over time, is the leader in neoclassical process (Han and Kaya, 2004, p. 315). It claims convergence that explains fast growth rate for underdeveloped countries to catch the developed ones. Low GDP per capita levels converge to the steady state position with higher growth rates. It also assumes diminishing returns to scale. Hence, this convergence is conditional, depending on different saving rates, population growth and production factors (capital and labor) at the steady state levels, changing across the countries. Technological change is exogenous; it cannot be internalized since it is contrary to competitiveness (Barro and Martin, 2004, p. 17).

$$\Delta k = sy - (d + n)k \tag{1.3}$$

At the steady state level, savings (s) are sufficient to encounter depreciation (d), also to equip new labor force with investments. In the above equation, n is the population growth rate; y is output per labor. It displays when sy exceeds (d+n)k, capital per labor (k) increases and when change in k becomes negative,

the opposite holds true. At the end of this process, steady state level is achieved.

1.3.2.3. Growth Models of Human Capital Inclusion

Human capital is the ability of a person to produce more income. It stems from investment made for labor force. It comprises of education, health and nutrition expenses, all of which complete each other. It is vital to employ them in balance in order to benefit from human capital. Introducing it into the model affects production and time allocation (Grossman, 1999). Elements of human capital are health, school and formation, preschool investment in children, search of employment, migration, information's evaluation, family and population (Di Bartolo, 1999, p. 2).

John S. Mill, Adam Smith and Alfred Marshall are the first economists who mentioned human capital in economics (Kibritçioğlu, 1998). Some economists such as Denison, Thedore Schultz and Gary Becker developed Smith’s insights and human capital theorem in the second half of the 19th century (Savedoff, W. D. and Schultz, T. P., 2000). Mankiw, Romer and Weil (1992) advanced neoclassical growth model with human capital by employing labor force enrolled in secondary education as an indicator for investments in human capital. The findings exhibit a positive relationship between human capital accumulation and economic growth. Hence, Hartog and Brink (2007) takes human capital concept one step further by expanding it from education level to vocational and technical studies and specific entrepreneurship-orientated courses.

Educational attainment and schooling improve real skills, abilities and resources as well as health. It makes a great contribution to human capital to be more effective. It sustains better life conditions especially increasing the income level. Education makes humans to gain more cognitive skills. This impact is revealed by learned effectiveness. Another pathway occurs by healthy lifestyles as personal control over life enhances. Hence, education enhances health status.

Health is an unintended result of wealth. Health is described by the World Health Organization (2011) as the following:

> "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (Mirowsky and Ross, 2003, p. 33)."

Barro and Sala-i Martin (2004) claims the importance of human capital in the form of education and health on growth. Health and education also have impact on each other. Hartog and Brink (2007) goes over a wide literature for the impacts of education on health. Also, it contributes to the literature that parental education is one of main factors that affect health. All the links between education and health are positive. But the impact of education on health takes a long time (Mirowsky and Ross, 2003).

Longevity in a society means increase in labor supply. Besides, healthy labor contributes more to productivity. Organisation for Economic Co-operation and Development (OECD) expresses that education and health are the parts of human capital (Keely, 2007, p. 96). Mirowsky and Ross (2003) implies the human capital concept that education supplies higher social status and better health. There is no doubt that education improves health. However, how it happens is the key issue in the literature. According to the perspective of "education as learned effectiveness", it enables people's health to become better since education is a root for being healthy.

1.3.2.4. Extended Neoclassical Growth Model

It was recognized that Solow's convergence claim were not justified. Mankiw-Romer-Weil (1992) expanded mainstream growth model adding human capital in addition to physical capital and population with conditional convergence. The condition is if initial income level is the same, there will be convergence between poor and rich countries. There is a stable equilibrium level in extended neoclassical growth model. At the equilibrium point, capital stock and production increase as much as the growth rate of labor and also income per worker and

capital stock per worker remain stationary. Under favor of the law of decreasing productivity, different levels of income per worker converge over time.

$$Y = K^{\alpha}.H^{\beta}.(A.L)^{1-\alpha-\beta} \quad (1.4)$$

Y demonstrates output, physical capital (K), human capital stock (H), labor (L) and technology (A). They are the variables in the extended Neo-classical production function. Hence α, β and (1 - α - β) are efficient income elasticity for each variable.

1.3.2.5. Models of Endogenous Growth

It is assumed that the new period's endogenous growth models started with Romer (1986) due to the fact that the convergence phenomenon envisaged by the neoclassical growth theory is not fully supported by the data. Unfair distribution of income in the world, the transition process to the imperfect competition markets and the need for intellectual property rights (patents, etc.) have shifted the interest from the neoclassical model to the internal growth theories (Solow, 1994; Romer, 1994). Endogenous growth models do not support convergence; however, divergence is even possible. The law of increasing returns is the main assumption for endogenous growth models that separate them from neoclassical growth models. By this assumption, growth is described inside the model which gives its name.

In the literature, there are various classifications for endogenous growth models based on the factor that are engine of growth. In the first group models, technological development is evaluated according to the result of the activity such as savings, investment, learning by doing, human capital and public expenditures. The distinctive feature of the second group of models is that technological development is accepted as a separate sector. The second group of models are called “research and development (R&D) and innovation-based models” in the literature. However, another classification method that directly depends on which activity leads to technological development will be followed:

i) The AK model,
ii) Human capital model,
iii) Public spending model,
iv) Learning by doing model,
v) R & D model.

The AK model is based on constant returns to scale. All investment types increase the marginal return of capital. Its distinctive feature is that growth endures internal variable which are the saving rate and the investment parameter. However, the model does not mention knowledge about reasons for constant returns and how technological change becomes. This model includes human capital. H shows both human capital and physical capital. A is the external constant. Physical capital does get positive contributions on human capital; hence decreasing returns to scale is not valid in the AK model.

$$Y = A\,K^{\alpha}.(H.L)^{1-\alpha} \tag{1.5}$$

Human capital model was firstly mentioned by Lucas and it was improved by Barro (1990) and Mankiw, Romer and Weil (1992). Lucas claims the importance of externalities created by education investments (Kaynak, 2009, p. 217). Barro underlines the significance of increasing the basic education period with the more educated labor force and physical capital investments (Taban, 2009, p. 69). Health is a form of human capital. Bloom and Canning (2003) explain it by casual relation between living longer and higher saving rates for retirement process. More savings stimulate investments in developing countries especially. Human capital not only increases the productivity of the workforce, but also creates externality during growth. More human capital brings more productivity growth. This situation leads to differences in welfare among countries.

Human capital investments are not just related to education but also about health, sports, recreation and nutrition. Hence, it is essential to allocate resources for training the labor force overtime and its contribution to domestic production (Goldin, 2014, p. 64).

Barro laid the foundations of the public spending model in 1990. It focused on the importance of the state in the process of growth and development. Growth is based on investments for government expenditures (g) which are financed by taxes and increases economic growth up to a certain level of efficiency. The state in the public spending model is "complementary" contrary to the entrepreneur and investor role in the Keynesian model. Infrastructure investments made by the public increase the efficiency of the private sector.

$$f(k,g) = Y = A\,k^{\alpha}.(g)^{1-\alpha} \tag{1.6}$$

Learning by doing model was revealed by Kenneth J. Arrow in 1962. The unit costs of companies decreased over time. Product quality and production speed increased, which were due to the increasing experience of the companies. Firms learn their business well since they produce, develop their products and create new brands. There is increasing returns to scale. As physical capital investments increase, technological knowledge will transfer into the country more. The investment of a firm leads to an increase in both the capital stock and the firm's know-how. In addition to increasing the physical output of the companies, they produce new ideas. Learning efforts of firms will increase growth. Accordingly, this technical knowledge will be transferred to the other firms. Positive externalities will spread over the firms on production process (Kaynak, 2009, p. 216).

R&D model was proposed by Romer (1986). The model is based on monopolistic competition markets (Krugman, 1990). There are two sectors in the model: manufacturing sector and R&D sector. While consumption and investment goods are produced in the manufacturing sector, new ideas and techniques are produced in the R&D sector. Distinctive feature of this model separating it from learning by doing model is that it is created by R&D sector consciously. Inventions and innovations for production are to assume the source of growth. The owner of the knowledge uses its legal rights such as getting patent and profiting from it. Profitability will accelerate the development process and more production, innovation will be made (Romer, 1990). Aghion and

Howitt (1992) mentions the importance of industrial innovations improving the quality of products by patent.

Therefore, it is accepted that technology is an internal factor in endogenous growth models, as firms produce their own technologies through different channels such as learning by doing, R&D studies, training activities.

CHAPTER 2:

FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH

There is a huge variety of literature on the relationship between FDI and economic growth. Some of the interesting questions in this context are the causality dimension of this relationship and the channels affecting economic growth. Most studies have relied on that it may change according to the countries. This linkage will be explained respectively after the defining of foreign direct investment. At first, it is discussed from growth to FDI and secondly vice versa.

2.1. CONCEPT OF FOREIGN DIRECT INVESTMENT

The concept of foreign direct investment includes purchasing and acquiring factories, branches, immovables and companies outside the country. So far, there are many definitions that have been made for FDI. Oatley (2012) makes a description for FDI as:

> "A form of cross-border investment in which a resident or corporation based in one country owns a productive asset located in a second country. Multinational corporations make such investments. FDI can involve the construction of a new or the purchase of an existing, plant or factory (Oatley, 2012, p. 376)."

Sobel (2006) defines FDI as:

> "Investment in control of productive facilities overseas, usually defined by an investment that amounts to control of 10% or more of a company's equity."

Both identifications include productivity and mention knowledge how to use foreign source (Kerner, 2014, p. 806).

Özcan and Arı (2010) define FDI as investments made by multinational companies, establishment of a new factory and purchase of a company which already exists.

FDI is monitored in the financial account in the balance of payments. It has several macroeconomic effects in a country. For instance, it positively affects the tax incomes by taxes and domination of profits.

2.1.1. Determinants of Foreign Direct Investment

There should be appropriate political, social and economic conditions in order to draw FDI directly in a developing country. High population, domestic demand, productivity, growth potential and low wages are among the desired features of a developing country. Therefore, the political situation of the country to be invested in and many factors related to economic and social conditions play roles in the decisions of investors (Ökten and Arslan, 2013). Before companies decide to carry out FDI, they analyze many factors that exist in the target countries and then they ensure that they can continue their activities with maximum profit in production centers.

The importance of competition for FDI has boosted as barriers for international investment have decreased. Potential determinants of FDI are growth rate, trade deficit, market size, labor cost, openness, exchange rate and tax (Marcelo et al., 2001; Bandera and White, 1968). Underlying factors determining FDI level change across countries at various aspects of developments (Blonigen and Wang, 2004). It is possible to make different classifications. Determinants of FDI are internal factors based on the theory of “pull-factor” just as socioeconomic basement and financial liberalization degree. Chin and Ito (2006) support that trade openness is prerequisite for financial liberalization. External factors are growth and interest rate according to the theory of “push-factors” (Rafat and Farahani., 2019, p. 236). Furthermore, Moon (1997)

mentions entry modes for foreigner alliances to enter the country and presents location factors besides market failure.

Infrastructure systems, economic independence and financial development, information technologies, innovation changes, geographical and cultural proximity are assumed to be the determinants of FDI in the literature. In the host country, the bureaucratic structure and the services transferred to foreign investors after the investment have a great importance for drawing FDI. Firms carry out their activities in the most effective way. FDI prefers the countries in which bureaucratic procedures can be easily handled, bribery and corruption are at the minimum levels.

Some studies claim that growth rate and openness have positive impacts on flow of FDI, others have found insignificant relation. In brief, countries having cheaper capital cost, higher entrepreneurial ability, high technology, having privilege to reach raw materials, bargaining and political power are lucky to take FDI to them (Moosa, 2002). Alguacil et al. (2011), for example, study with a sample of developing economies during the period 1976–2005 and finds the importance of economic and political infrastructure to attract FDI.

2.1.2. Types of Foreign Direct Investment

The description of FDI includes long term investment relationship and control. There are various sorts of FDI. Firstly, FDI is classified as joint ventures, greenfield investment, mergers and acquisitions. Generally, FDI investors who find it commercially risky prefer joint ventures with local firm. Greenfield investments sustain long-term returns because they boost capital stock. In some cases, FDI cannot create the expected benefits in production and employment in the form of purchase of real estate or purchase of an existing factory, that is, ownership change. By introducing new technology, FDI can have impacts to boost productivity, profitability and change production.

In regards of another theory, FDI is classified by two categories such as “horizontal” (market-seeking) and “vertical” (efficiency-seeking). Horizontal FDI means to produce identical goods and provide services at the same quality in different countries but to serve locally. The advantage is to remove transportation costs by reaching foreign market. In vertical FDI, production is divided into aspects in order to get benefits from relative factor costs if the multinational corporations come across geographically. The above table makes comparison between vertical and horizontal FDI by presenting a check list for country characteristics and economies of scale (Table 1). If trade openness is high, horizontal FDI is expected to be low. If the per ratio of vertical FDI is high, it leads to high levels of FDI.

Table 1. Conditions for the Existence of Vertical and Horizontal FDI

Country Characteristics	**Vertical FDI**	**Horizontal FDI**
Absolute market size	Small	Large
Relative market size	-	Similar
Relative factor endowment	Different	Similar
Trade costs/barriers	Low	moderate/high
Tariff barriers	Low	High
Economies of scale		
Firm level	-	Large
Plant level	-	Low

Source: Protsenko, A., 2003, p. 19.

According to the investment purpose, FDI can be assessed in four main headings: seeking for resource, market, efficiency and strategic asset investments. Location theory, strategic behavior, the theory of transaction costs, product life stages hypothesis, oligopolistic reaction theory and eclectic theory are the main theories of FDI. Among them, Dunning's eclectic paradigm, product-life-cycle theory by Raymond Vernon for trade and investment and Stephen Hymer's seminal work (1976) are called the conventional theories.

According to the location theory, Hood and Young (1979) suggest four factors related to the place of establishment of FDI (Buckley, 2000, p. 369). They are labor costs, market factors, commercial barriers and government policies and all based on cost advantages (Moshirian, 2001, p. 318; Dumludağ, 2009, p. 17). In accordance with the location theory, low labor costs, a sustainable investment conjuncture, absence of commercial barriers and some market factors impress the amount of FDI inwards.

On the other hand, strategic behavior theory concerns the firm's competitive position. Competitive behaviors are particularly important in strategic behavior approach. Therefore, companies will try to maximize their benefits without being caught by competitors.

The theory of transaction costs was developed by Oliver Williamson. Investors wishing to take benefit from the cost advantage prefer to carry out the production or production process of labor-intensive products in countries where this factor is abundant and cheap. Firms act for the criteria of making minimum production and transaction costs and determine the partnership structures accordingly. Production costs vary according to the scale of firms, information and technology level.

With reference to the life cycle theory of product, there are various processes such as innovation, maturation and standardization from the first invention stage to the mass production. It is based on four basic assumptions which are different in terms of preferences for each country, the existence of economies of scale in production process, limited information flows, products adaptable for the changes in manufacturing and marketing techniques of firms (Edwin and Lai, 2001, p. 70).

The purpose of oligopolistic reaction theory is to preserve the technological superiority and monopolistic advantage of the innovative company. The profits of a product that comes on the market are observed with an increasing graph by benefiting primarily from monopoly economies and entering the branding

process. With the realization of profit opportunities in the market by other companies, market entrances begin and the profits of the product from the market decrease. At this point, companies can make product diversification and search for new customers or new markets. Investors can take the production to foreign markets where the production has not taken place before or where competition is relatively limited.

Oligopolistic reaction theory attempts to clarify FDI in oligopolistic industrial structure. The main feature of this market is the interdependence between firms. Since there are few companies in oligopoly that can influence each other, the decision of any company in the market regarding production, price and sales is closely related to other companies. In the event that one of the competing companies invests in the oligopolistic industries, other companies operating in the same industry follow the leading company and they are engaged in investment activities due to oligopolistic reaction. It was studied by Knickerbocker who examined the direct investments of US multinational companies. At the end of the study, it was found that multinational companies operate in an oligopolistic industry structure. From this point of view, it is concluded that the market structure in which companies operate in the country outside the national borders is important. Moreover, considering that the market structure in Turkey is oligopoly, it is unlikely that firms will not follow each other in their investment decisions.

Eclectic theory is the combination of theory of strategic behavior and transaction costs. A framework has been developed by Hill, Hwang and Kim by combining explanations and different ideas are discussed in the literature. Regarding the theory, entry into a foreign country is provided by strategic, environmental and specific variables of the process. In order to make the most appropriate decisions for multinational companies, it is necessary to determine the input type which will take maximum number of long-term values of firms by addressing a large number of variables. The type of entry through FDI will be preferred when a global strategy is required. When there is a global strategic

coordination, high amounts of specific know-how of the firm requires great confidentiality (Aydın, 1997, p. 37).

Dunning's eclectic paradigm includes some advantages for investing abroad just as ownership, location and internalization (OLI) (Dunning, 1970; Oxelheim et al. 2001). Dunning (1993) concludes three conditions of FDI to enter a country and it is called as the OLI paradigm. These are ownership, internalization and the spatial advantage of the market. The ownership advantage is technology (patent, trademark). Advantage of internalization is product or process internationalization by licensing or franchising. The spatial advantage is that the firm produces factor prices in its country of production by commercial regulations, institutional, exchange rates and political stability of the government (Bevan and Saul Estrin, 2004, p. 777-778; Dunning, 1993).

2.1.3. Benefits and Disadvantages of Foreign Direct Investment

Importance of FDI has risen in developing countries every year. The most important reason for this is the benefits made by FDI to the country. One of the advantages of investments is the additional external resources (Harrison, 1994). This resource supplies both the capital that they initially brought to the country and development of the country's production capacity. Therefore, both developed and developing countries are making great efforts to attract FDI to their countries.

FDI is permanent and gives management authority to the investor; they may make changes to boost productivity in order to acquire more profit, thus, introducing the way of production by technology. Therefore, especially developing countries want to draw FDI from other countries. FDI is an important instrument for transferring technology in recent decades (Borenztein et al.,1995). However, FDI has also some disadvantages. In this section, besides benefits, disadvantages of FDI will be mentioned.

Benefits of FDI are various. They can be summarized as contributing to the capital accumulation and production capacity, affecting economic growth, employment and technological development positively, contributing to the development with the innovative management and marketing approach it brings, creating a sustainable and trustable competitive environment within the country, bringing know-how, protecting the environment, improving human resources, increasing tax revenues, benefiting from the prestige and opportunities of foreign companies in overseas promotion, the political and economic support from developed and capital exporting countries provide. FDI can promote entrepreneurship and encourage domestic investments in a country. Hence, FDI positively affects the balance of payments of the country by providing the substitution of imports and reducing import and the burden of payments related to import-related foreign exchange payments. Direct effects of multinational companies are rise in local employment, high paid job opportunities, technical and occupational training opportunities, creating added value. The indirect effects are the high value-added trade opportunities for the host country. The most important advantage taken by FDI is the restructuring of the economy through multinational companies. This is considered as sectoral, intra-sectoral transformation and intra-industry shifts. These structural transformations can take place in the form of shifts from low-productivity and labor-intensive to high-value-added sectors or production of goods and services. The contributions of FDI on growth and development can be listed as technology, human resources management, capital formation and development, trade, competitiveness and environmental aspects (Karlsson et al. 2007; Moran, 2006).

Besides these advantages of FDI, there are also some disadvantages. Potential risks are foreign commercial firms leading to internal brain drain. Health system may turn to providing high quality service for the rich and vice versa for the poor. The crowding-out effect may encourage public sector to follow technological improvements; on the other hand, it may lead countries to impose limitations on FDI (Smith, 2006). In some cases, such as infant industries, it can have a negative impact on the learning and development process, leading to exclusion.

In other words, it may cause crowding-in and out effects on infant industries. On the other hand, it may prevent market access by increasing finance costs.

The other disadvantages can be listed below:

i.) Foreign capital, which is adopted without being bound to a plan, can capture the main sectors.

ii.) If advanced production techniques are applied in foreign capital enterprises when there is traditional production structure in the fields, they may all lead to disrupt the integrity of economy.

iii.) In the face of small-scale domestic enterprises, foreign-owned enterprises have the amount of capital, advanced technology and management knowledge and this gives them a competitive advantage. It means that domestic enterprises leave the sector, and this can lead to a complete monopoly in the economy.

iv.) Foreign capital enterprises should carry out their own research and development activities to force domestic companies to adopt new technologies, it may cause the country to become externally dependent on technology (Nourbakhshian et al., 2012).

Foreign investors do not invest adequately in the countries that domestic capacities are low and inadequate changing potentials over time. Multinational enterprises (MNE) may have negative effects of FDI in the home countries. They may cause a lack of knowledge and coordination in investment process, unequal distribution of benefits and weaken the host's capacity while regulating the market (Nourbakhshian et al., 2012, p. 277).

The potential negative impacts of FDI on the host country are relapsing of the balance of payments and the negative impacts caused by the lack of positive ties with domestic unions, possible harmful environmental impacts especially in mining and heavy industry, social disturbances resulting from rapid commercialization for less developed countries and increases in incomplete competition in the local economy environment. In addition, in some host

countries official authorities perceive increased dependence on international firms as a deteriorate their political sovereignty.

2.1.4. The Effect of Economic Growth on Foreign Direct Investment

Recent many studies reveal that although there is a positive association between economic growth and FDI, the direction between the economic growth and FDI is unclear. However, bi-directional linkage nexus for FDI and growth is supported by numerous studies in the literature. Although there is no compromise among researchers, this section will include studies discussing impact of economic growth on FDI.

The research by Zhao and Du (2007) displays that more development, more FDI is encouraged in China. It supports the validity of market size hypothesis. It is based on some regressions with time series data. The way of analysis and its assumptions by different econometric methods find various contradicting results some of which support one-way relation between them.

For the period 1969-2000, it is found that developing countries such as Chile, Malaysia and Thailand had different causality directions while investigating the relationship among FDI and growth. The way of causality is from growth to FDI in Chile, though it becomes bi-directional in high income countries[2].

Economic growth is determinative for FDI inward in countries like Brazil, Mexico, Malaysia, South Korea, Thailand and Turkey. All these results demonstrate that especially developing countries should build sustainable economic infrastructure to sustain attractiveness FDI into their countries (Okuyan and Erbaykal, 2008).

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[2] These findings reveal that the determinants of FDI such as the quality of human capital, infrastructure, legal basis, institutions and tax systems to become more important (Chowdhury and Mavrotas, 2005).

In the literature, the findings about FDI-growth relation in Turkey are controversial. Some of them find bilateral relationship[3], others demonstrate one-way relation[4] between them. The results are varied based on the time and method employed. Despite all these different conclusions, the dominant view is that FDI is main distinctive factor for economic growth which is backed up by endogenous growth models.

2.1.5. The Contribution of Foreign Direct Investment to Economic Growth

The FDI-growth relationships do not only refer growth to FDI. The effect of FDI is indisputable especially for developing countries achieving sustainable economic growth. This effect is realized through physical capital rise and productivity increase. It contributes to employment, market structure, human resources development, technology transfer, management, trade, competitiveness, balance of payments and environmental channels. Generally, the findings are on the same side that FDI is beneficial for capital accumulation and growth in total factor productivity for developed countries. However, this relation is negative for developing countries if there is nonexistence of capital accumulation, transfer of knowledge, skill acquisition (Ajide and Adeniyi, 2010).

In contrary to different classification in the previous chapter[5], growth models are classified as the following by Hansen and Tarp (2001),

i.) The first-generation studies Harrod-Domar,
ii.) The second-generation studies of Harrod-Domar and Solow,

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[3] See, for example, Ilgun et al. (2010) and Bakır and Eryılmaz (2015).

[4] See, for example, Öztürk and Acaravcı (2010).

[5] Please see Chapter One.

iii.) Third generation studies, endogenous growth models. In endogenous growth models, the increase in productivity provided by technology and increasing knowledge are the most important factors rising growth. In Endogenous growth models, labor, capital and technology are generated inside the growth equation, not received from outside data (Lucas, R., 1988; Romer, P., 1986).

FDI has been accepted as the main trigger of economic growth in the neoclassical theory. The reason is that FDI can cause capital formation and boost employment and capital exports, bring resources such as capital, information and experienced managers lead the development and dissemination of technology (Dabla-Norris et al., 2010). Particularly in Central Asian countries, FDI is known to play a crucial role in the development of exports for industrial goods.

Another one claims that FDI promotes economic growth by a new growth theory framework enabling increasing returns and human capital accumulation by spill-over effects. It makes possible interactions for FDI and human capital following liberal trade and investment regimes in global market (Balasubramanyam et al., 1999). This impact is more in countries having high education level and middle-income level since they have sophisticated market and made it more open to trade and low population growth.

Theoretically, the findings of the study (Liu and Li, 2005) support endogenous growth model that FDI increases economic growth by technological transfer from developed countries to the developing ones. Moreover, other studies in literature claim that FDI may bring capital stock, knowhow, and technology to the country. In developing counties, FDI contributes economic growth by the way of labor training, diffusion, management practices, human capital and technology-absorptive ability (Liu and Li, 2005).

Literature research deduces common results that FDI contributes to growth. In accordance with the results of the study by Mello (1999), FDI boosts total factor

productivity (TFP) in developed countries, while it rises capital accumulation in developing countries, it does not soar TFP due to the insufficiency of savings and capital accumulation. Moreover, FDI supports economic growth and development if it can enhance health level and vocational training in a developing country. In reference to a research made in 31 developing countries for the period 1970–2000, there is a causality from FDI to GDP strongly (Hansen and Rand, 2006).

A research made by production function method including 43 developed and developing countries between 1993 and 2001 suggests that effects of technology sector investments and FDI on growth are much more in developing countries compared to developed countries (Papaioannou, 2004). Balasubramanayam et al. (1996) and Basu et al. (2003) are agreed with the findings that FDI affects growth relatively more in open economies than closed economies.

Effects of FDI on economic growth are positive and significant (Delgado et al., 2014 and Duttaray, 2001). Iqbal et al. (2010) find that FDI enhances the trade growth in Pakistan. Batten et al. (2009) state that higher level in education attainment, more openness to foreign trade, better stock market conditions and lower population growth have more effect on growth through FDI.

Kottaridi and Stengos (2010) have positive influence on growth for middle income countries while Omri and Kahouli (2014) find there are bi-directional casual relationships between energy consumption, FDI inflows and economic growth for the high-income countries.

According to Blonigen and Wang (2005) FDI affects growth more in less developed countries and ascended economies such as Hong Kong, Singapore than developed ones like Australia and Germany. FDI convergences developed countries but divergences underdeveloped ones. These results indicate FDI improves economic growth via productivity, human capital increase and provides development for long term in Nigeria (Gökmenoğlu, 2018).

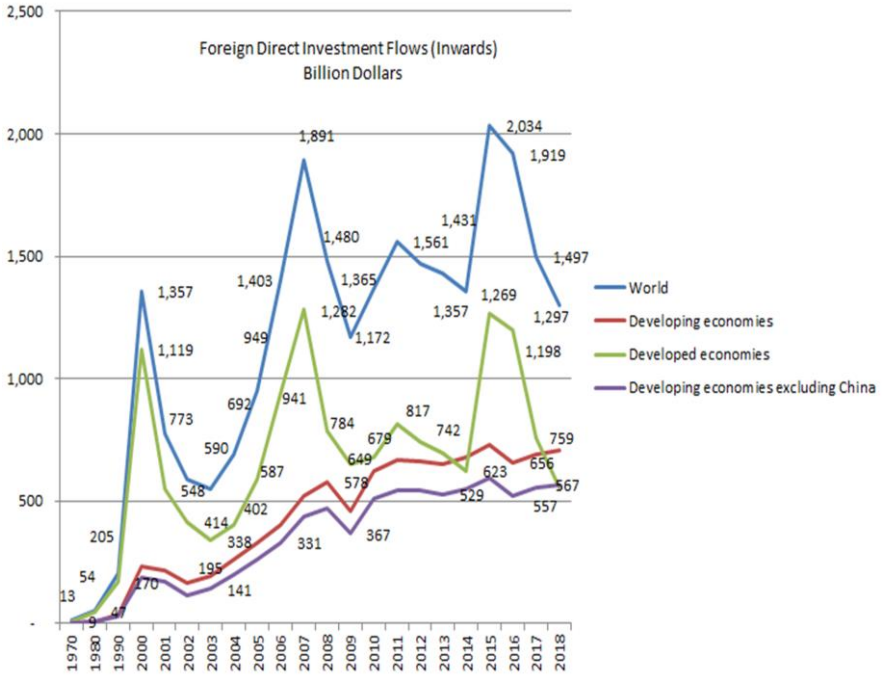
Development is a process that brings changes in economic, environmental, social and demographic components of countries and it takes a long period to achieve. Less developed and developing countries, which have low levels of savings and insufficient capital and resources, need external funding for their growth. Due to the permanent resource, providing this financial resource with FDI inflow instead of external debt is mostly preferred by these countries. In addition, FDI is preferred by these countries in order to increase production, employment and contribute to growth by providing information and technology transfer.

The resources are of great importance for countries on the way of growth and development in recent years when FDI inflows to developing countries have declined. Nowadays, the main problem of all the less developed and developing countries is that they cannot make development with their existing resources. There are structural problems preventing growth of the less developed and developing countries and capital decreasing yield.

Since national income is low in developing countries, saving rate keeps its low level. Thus, investments cannot be gone up and economic efficiency and national income remains low. This vicious circle can only be overcome by external sources. Low savings and investment cycles boost the need for external savings in less developed and developing countries due to low income. Finding finance just as FDI and borrowing abroad have become more important for countries like Turkey where there is current account deficit. There are various methods such as foreign borrowing, foreign aid and grant purchase, portfolio investments and FDI to meet the need for savings. Among them, FDI is more advantageous so as to contribute positively to the balance of payments due to the long-term resources and attracting new investments. Long-term borrowing may lead to an interest rate helix and there are some political drawbacks on it. Portfolio investments are risky and unstable as they generate short-term returns. Furthermore, the superior aspects of FDI compared to foreign debts can be listed as converting capital to investment, keeping a

portion of the resulting profit inside the country, contributing to production and employment through technology and information transfer and increasing domestic competition.

Developing countries have implemented reforms that gained momentum after 1980 to achieve a suitable economic conjuncture to encourage FDI inwards. Figure 1 represents FDI inwards in developed, developing countries including and excluding China and the world since 1970.



Source:UNCTAD,
https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=96740
Accessed Date: 02.04.2020.

Figure 1. Foreign Direct Investments in Developed, Developing and The Less Developed Countries

Especially in the 1980s, multinational corporations have globalized production networks in order to reduce costs in different countries (Hummels et al., 2001, p. 86). Many studies in the literature propose that multinational corporations (MNC)

possess more advanced knowledge because MNC account for prominent share of research and development expenditure in the world. While MNC investments possess these opportunities, application and taking advantage of them also require the existence of sufficient human capital (Borensztein et al., 1998) because some sectors inherently have more potential to transfer know-how, but some don't. Moreover, while some sectors such as information technology, machinery and chemical related sectors require skilled labour force, sectors like construction and agriculture may not require that skilled labour as much as the previous ones. Furthermore, FDI may contribute adoption of the new technologies. Therefore, there should be a training for labour force to get used to high technologies. So positive impact of FDI on human capital occurs in the long term.

FDI has a big impact on integration into global markets especially for developing countries. With globalization, FDI has raised gradually over the years. One of the ways is realized by global value chain. It is a method of understanding the company's operations as strategic effects of operations on cost and value. The value chain of a product or service covers the process from conceptual design of its to final consumer delivery of production, purchasing, distribution and consumption because of decreasing efficiency of capital, both companies' desire to articulate in the global value chain and the desire to expand outward in developed countries have raised FDI inflows in developing countries.

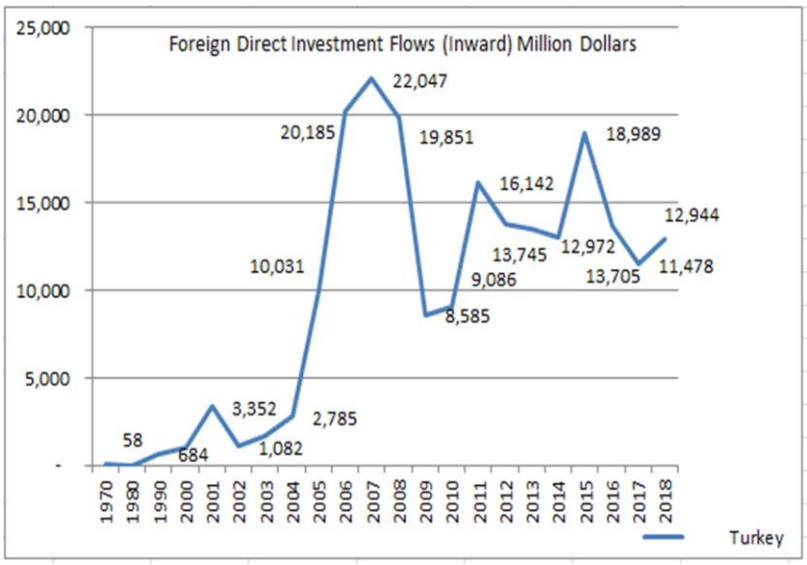
2.4.THE STRUCTURE OF FOREIGN DIRECT INVESTMENT IN TURKEY

FDI inflows to Turkey have dramatically begun to rise with the implementation of structural regulations started with planned period.

As of 1980’s FDI exhibited a limited rise due to the measures taken in Turkey. Implementation of foreign trade liberalization started in 1984 (Erçel, 1998). After this policy, increase in FDI flows has taken attention in a sharp way except crisis periods. In the 1990s, the annual average was 1 Billion USD. In the 1990s, FDI

was static for many years. There were sharp decreases in the process of economic crisis. Due to the crises of 1998 and the earthquake of 17 August 1999, investments were minimized in manufacturing and agriculture sector. FDI inflows to Turkey rose in the 2000s.

Despite there were negative effects of the 2001 crisis on FDI inwards, the importance of bank mergers and information-communication technologies and financial services sector declined these negative effects. Figure 2 demonstrates FDI inwards for the period between the years 1970 and 2018 in Turkey.



Source: UNCTAD, https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx, Accessed Date: 02.04.2020.

Figure 2. Foreign Direct Investment Flows (Inwards)

After the effects of 2001 crisis, serious process of increase were implemented. EU accession process for our country has been effective for this development. The date 17th December 2004 reflects the start of accession negotiations between the EU and Turkey to be a full member, which is extremely important in terms of economic development. The Customs Union has been an element driving the FDI as a type of integration. Its increasing impacts have considered in 2006 when FDI is at the top level.

2.4.1. Legislative Framework for Foreign Direct Investment

Turkey's investment legislation offers equality for all investors and simplicity of conformity to international standards. Legislative framework constitutes main basement for FDI flows. Historically the investment legislation is based on the followings:

i.) Multilateral and bilateral agreements (since 1962),
ii.) The Law No 4875 on FDI in 2003,
iii.) The Law No. 5084 on the Promotion of Investments and Employment in 2004,
iv.) The Regulation on FDI Act,
v.) Various laws regulating the promotion of investments on a sectoral basis and related sub-regulations.

The aim of bilateral agreements for protection of investments is to establish a positive conjuncture for economic cooperation between each side. Turkey signed treaties for double taxation prevention with 83 countries and social security agreements with 28 countries. Moreover, Turkey signed Customs Union Agreement with EU which allows trade to be made without any customs restrictions in 1996. It brings low-cost transportation, relatively low production cost and the well-educated workforce with advantages. In 2004, EU integration process accelerated so the highest amount of FDI inwards is achieved in 2006.

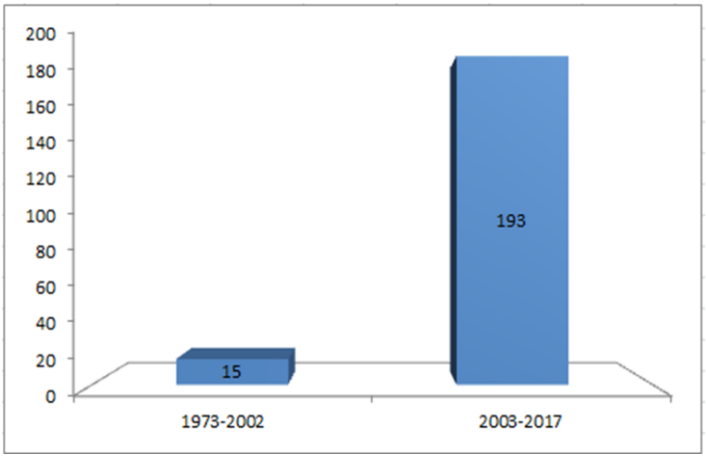
2.4.2. Sectoral and Geographical Distribution of Foreign Direct Investments in Turkey

Turkey needs FDI for the growth and development. In this context, it is necessary to attract more FDI to the country. To increase attractiveness of FDI, some implementations such as research and development, technological innovations, and skilled labor force structure should be launched and supported. The main expectations of FDI are to create high added value technology, new

investments and employment in Turkey. This will obviously contribute to economic growth and decrease unemployment rate in the long run. To increase the performance and competitiveness, a country should boost product diversity, improve the adaptability to innovation and invest in research and development. Investing in physical and human elements is also possible through openness, new information and technology entering the country by first adaptation and reproduction.

During planned period in Turkey, FDI inwards coming to Turkey has been comprised of high-tech products which are of great importance in terms of increasing our global competitiveness. As a matter of fact, attracting low and medium-low technology investments will contribute relatively lower. It is essential to move the level of medium higher and advance in technology.

Liberal policies implemented after 1980 also encouraged FDI in a great extent. Improvements in law, reduction in bureaucracy, decrease in custom taxes, liberalization of foreign exchange regime and mutual exchange of investments with various countries encouraged FDI inflows. Significant rises in foreign trade volume because of these steps also manifested itself in FDI.

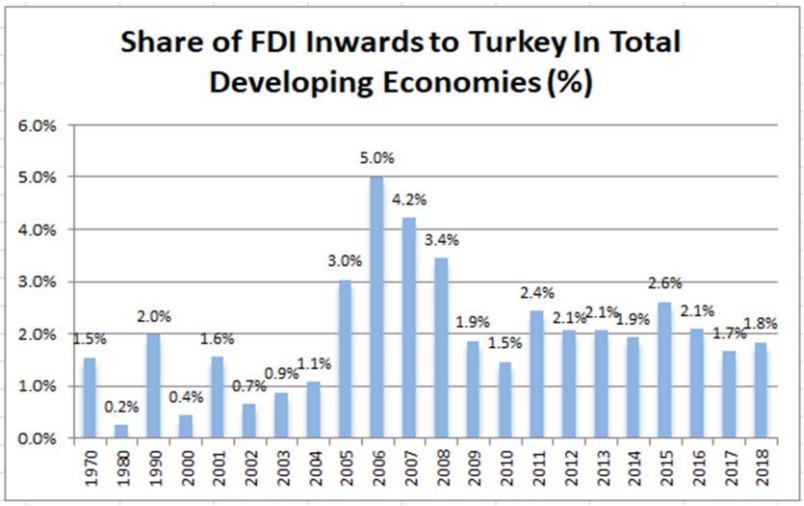


Source: Central Bank of Turkish Republic

Figure 3. Foreign Direct Investment Inwards In Cumulative (Billion dollars)

Considering the development of FDI in Turkey, it has been revealed that there is significantly cumulative rise in 2003 (Figure 3).

In Figure 4, it is seen that share of FDI inwards in developing countries soared in 2006 because the effects of EU integration process. In fact, it was the peak level. Then it started to decrease. In 2011, a sudden increase occurred in the share of developing countries. In the last five years, there was a decrease in FDI inwards share of developing countries[6].



Source: UNCTAD

Figure 4. Share of FDI Inwards of Turkey in Total Developing Countries

Table 2 indicates sectoral distribution of FDI inwards in Turkey for the period between 2005 and 2019. For the last few years, services sector has been the sector which mostly attracts FDI in Turkey. Although ratio for services sector

[6] The countries, most of FDI come from, are Europe, North America and the Gulf countries, and the share of Asia has boosted for the last fifteen years. Among them, Europe comprises the most with countries such as the Netherlands, Austria, Germany, Belgium, England, Luxembourg, Greece, France and Spain.

falls over the years, it continues to be the highest share of FDI inwards. Manufacturing is in the second rank in general. Mining and agriculture sectors are in the third and last ranks respectively. This order changes according to the years.

Turkey needs large amounts of foreign source to continue development and sustainable growth trend since it is in the category of developing countries. It should use these sources to establish factory, facility which gets producing, create employment, open new branches and establish subsidiaries through FDI.

Table 2. Sectoral Distribution of FDI Inwards In Turkey (2005-2019)

Years	Agriculture Sector	Mining Sector	Manufacture Sector	Services Sector	Others
2005	0.1%	0.5%	10.1%	89.3%	-
2006	0.0%	0.7%	9.6%	83.05	6.6%
2007	0.0%	1.8%	21.6%	73.6%	3%
2008	0.3%	1.0%	26.9%	64.6%	7.3%
2009	0.8%	1.4%	26.2%	37.2%	34.4%
2010	1.3%	2.2%	14.8%	52.6%	29.2%
2011	0.2%	0.9%	22.3%	50.0%	25.6%
2012	0.4%	1.7%	42.0%	48.7%	7.2%
2013	0.4%	6.8%	27.0%	48.3%	17.3%
2014	0.7%	4.4%	31.8%	50.0%	11.1%
2015	0.3%	1.7%	35.0%	51.9%	9%
2016	0.5%	2.0%	29.8%	58.7%	5%
2017	0.4%	6.1%	16.2%	72.3%	10.5%
2018	0.7%	1.1%	30.6%	57.2%	0.1%
2019	0.7%	0.3%	35.7%	63.2%	6.6%

Source: Central Bank of Turkish Republic

CHAPTER 3:

LITERATURE REVIEW

The primary studies in the received literature on the relationship between health and FDI are summarized in the Appendix 1[7]. The association between health and FDI has been mostly studied by using panel data in the international literature. However, only a few studies employ health production function approach. As far as we know, no previous research for Turkey has investigated the relationship between life expectancy (health status proxy) and FDI. This is one distinguishing feature of our study. This study is also expected to make an original contribution by employing *health production function approach* which originates from Grossman's Health Model (1972) to analyze the bilateral relationship between health and FDI for Turkey with the control variables of economic growth, education, trade openness and health expenditure.

Note that there is a *mutual association*[8] between FDI and health. 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.

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[7] Further description including econometric method, countries and time period is available in the table in Appendix 1.

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

3.1. HEALTH PRODUCTION FUNCTION

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

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

At the microeconomic level, health is a function of several health indicators so we can represent it as H= f(X) where H represents health output and X represents vector of health indicators. The elements of the X vector involve food intake, individual 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 level analysis (Fayissa and Gutema, 2005).

In fact, Grossman's theoretical health model is a microeconomic model. On the other hand, it can be used for macroeconomic level 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[9] (i.e., pollution per capita etc).

The model can be written explicitly as follows:

$$h = \lambda \prod_i Y_i^{\alpha_i} \prod_j S_j^{\beta_i} \prod_k V_k^{\gamma_k} \qquad (3.1.)$$

where αi, βj and γk represent the corresponding elasticies.

According to Grossman (1972), health enhances labor productivity both directly and indirectly. First, healthy individuals are better educated compared to 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 more easily. Improvement in health develops ability to learn as well as skills. As the life becomes longer, education investments become more attractive. Healthy work force becomes more productive and contributes to human capital (Verulava, 2019).

In empirical studies, health status is proxied by different measures such as life expectancy, morbidity and mortality. In general, explanatory variables change according to the purpose of the research and the availability of continuous, reliable and effective data. On the other hand, Grossman's theoretical model was extended by many researchers' criticisms. Main criticized points are the ambiguity of life length and the constant returns to scale (CRTS) assumption of medical investments. Ehrlich and Cuma (1990) generated decreasing returns to scale (DRTS) health production function which has more realistic specialties

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

than Grossman's constant returns to scale (CRTS) model. A model with DRTS provides realistic presentation since, in the real world, health production process can be expected to have decreasing returns to scale and increasing marginal costs. An example for this situation is that great health conditions can be reached by low investment levels such as improving sanitation as Galama et al. (2012) has pointed out. Galama and Kapteyn (2011) is the first study which improved Grossman's Health Model (1972) by adding DRTS. The model with DRTS submits negative linkage between health and medical investment by removing some limitations of Grossman model. It suggests that wealthy and educated people live longer, current health status is affected by former situations and life is finite. These advantages reflect the reality and make the analysis reliable (Galama, 2011).

Health affects economic growth through microeconomic and macroeconomic channels. On the microeconomic level, the interaction is labor productivity and labor force participation. Healthier society brings labor productivity and rise in labor force participation rate due to increase in longevity. Also, the channels are macroeconomically related with the relationship between health and income. Bloom et al. (2004) explain how health affects GDP per capita. For example, child illness causes child malnutrition and reduces schooling and affects cognitive capacity seriously. They all lead to higher child mortality. On the other hand, adult illness and malnutrition reduce investments in physical capital and decrease labor productivity. All of them are expected to decrease economic growth.

The process of interrelated relationship among health, productivity growth and economic growth occurs via the enhancement in life expectancy contributing to the spread of education, which is the source of human capital. When life becomes longer, education period prolongs and return on investment in education increases, too. The human capital improves economic growth by way of these mutual linkages. On the other side, the fact that FDI may induce health negatively by leading to poor quality in health and education. This impact is

expected to affect economic growth negatively. If there are high mortality rates in a society, human capital could not progress easily.

Another positive effect of increasing life expectancy at birth (health level) is that it increases economic growth performance because of the increase in workforce. The population structure of a society is evolving through the process of the increase in the division of labor force into the size of population. Countries with such high labor force population development are expected to reach higher levels of income per capita. So, they decrease the rate of bad habits causing addiction such as smoking, alcohol, and drugs, and increase labor force participation (David et al., 2008, pp. 257-258). In fact, both the microeconomic and macroeconomic sights have common basement which is labor productivity.

3.2.RELATIONSHIP BETWEEN FDI AND HEALTH

This section aims to introduce health output literature that is related to FDI. In terms of being descriptive and effective, the variables, data type and the econometric method used in the related studies are explained. Literature research on health and FDI can be classified into two categories: effect of FDI on health and impact of health on FDI. Relevant literature on the nexus of FDI and health is summarized in table[10]. Life expectancy is used to proxy the health status of country's population in many research. 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. Higher life expectancy is associated with better health status (Murray and Lopez, 1996).

[10] Complete literature including bilateral relationship of FDI and health is presented in the table in Appendix 1.

Moreover, good health affects FDI positively and the impact of poor health is a decrease in FDI. Health status is an important factor to attract FDI. Healthy society raises worker productivity and accelerates economic growth, and it draws more FDI. The improvement in the level of health encourages FDI inflows. A foreign company may have less willingness to invest in a country with high rate of infectious disease, unhealthy labor, low educated, low skilled labor and low income. A healthy and long-lived society makes the country attractive for foreign investors, so FDI 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. FDI may induce health both positively and negatively. FDI inflows may impact health positively by the income effect. FDI inflows may affect health negatively by infectious diseases, creating pollution and intensive working effect.

3.2.1. Effects of FDI on Health

There are few researches examining the impacts of FDI on health. Some of these studies find positive effects and some of them finds negative ones. Also, only a few works in the literature demonstrate both positive and negative impacts. First, the studies with positive effects will be presented and then negative ones will be mentioned with reasons in the following subtitles.

Burns et al. (2017) find a beneficial impression of FDI on mortality rate for adults in LMICs. They find that a 1% rise in FDI to GDP boosts life expectancy by

0.993 year[11]. Alam et al. (2016) employ life expectancy as the dependent variable when trade openness and FDI are independent variables in a model for Pakistan. When FDI increases by 1%, life expectancy improves by 0.159% for the period of 1972-2013. A 1% rise in trade openness causes improvement in life expectancy by 0.364%. FDI may induce health via the technology transfer channel, increasing growth and education level. There are some other opposite views such as those that state an open economy may lead to the faster spread of contagious diseases. Moreover, FDI inflows may lead to negative environmental effects which will be mentioned in the next subtitle in detail.

According to Firebaugh and Becki (1994), when FDI as percent of GDP soars 1%, female/male life expectancy at age 1 boosts 0.18% for 1965-1988 in 62 less developed countries. When FDI as percent of GDP boosts by 1%, female/male life expectancy at age 1 goes up 0.18%.

Lenhert et al. (2013) present that FDI improves the host country's welfare and knowledge level between 1997 and 2007 in 150 countries. When FDI as percent of GDP boosts by one unit, life expectancy at birth rises 0.516%, education index rises 0.604%, GDP index boosts 0.3% and HDI boosts 0.37%.

On the other hand, there are several studies having negative relationship. Herzer and Nunnunkamp (2012) find negative effects of FDI on health for some countries such as Austria, Canada, Denmark, United States and several European countries between 1970 and 2009. When there is a rise in the ratio for FDI to GDP by 1%-point, life expectancy decreases 0.028 years. It means that FDI-to-GDP ratio boosts about 0.022% points per year and life expectancy decreases by 2.65 hours per year approximately.

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[11] Also, Burns et al. (2017) researches effect of health on FDI. It wil be mentioned in title “3.2.2. Effects of Health on FDI: Source of Endogeneity”.

Steensma and Reiter (2010) find that an increase in FDI flow decreases year to year improvement in life expectancy by 2.54% between 1980 and 2006 in 49 developing countries.

Johnson (1997) examines the effect of MNC investment on infant mortality by a cross-national study for the period regarding the years between 1967 and 1973 in 67 developing countries. It concludes that this impact is negative especially in sectoral MNC investment in the manufacturing and agriculture sectors. Besides, MNC investment in manufacturing leads to significant reductions in secondary school enrollment and government health and educational spending. The significance of the study is the sectoral division in MNC investment which is in the extractive industries, manufacturing and agriculture are deemed as traditional dependency. It declares that MNC investment in manufacturing and agriculture sector have negative effect on infant mortality (Johnson, B.D. 1997).

Stephens (2016) examines the association between FDI and well-being in poor countries as measured by life expectancy and child mortality between 1985 and 2010 in 125 less developed countries. All the results were insignificant except that FDI concentration decreases life expectancy in Asian countries.

Cao et al. (2017) explain when FDI rises 1%, adjusted life year decreases 0.0107% in 23 Asian countries. They lead to the reduction in inequality in education, but the rise in the inequality in income for 2013-2015 in 23 Asian countries.

Gökmenoğlu et al. (2018) find that a 1% rise in FDI inflows decreases life expectancy at birth by 0.059% between 1972 and 2013 in Nigeria. A 1% boost in FDI leads to a rise in GNI by 0.851%. Besides, it is found that FDI makes contribution on education and income in Nigeria.

There is just one study finding both positive and negative relations (Nagel et al., 2015). It examines the interrelation between FDI and health for a sample of 179 countries for the period between 1980 and 2011. The findings are differentiated

based on the level of income per capita. The coefficient representing the affect is positive at lower income level, and then decreases as the income boosts, lastly becomes negative at higher levels of income. Using infant mortality has been constructed as the weakness of the mentioned study.

Table 3. Studies from FDI to Health[12]

Study	**Method**	**Independent Variable (FDI)**	**Dependent Variable (Health output)**	**Effect to Health**
Stephens (2016)	Fixed Effect Model	FDI concentration	Life expectancy	Negative
Firebaugh and Becki (1994)	Difference of log models	Foreign investment as percent of GDP, GNP pc	Life expectancy at age 1 women/men	Positive
Herzer and Nunnunkamp (2012)	DOLS	FDI	Life expectancy	Negative
Johnson (1997)	Fixed Effect Model	MNC penetration	Infant mortality rate	Negative
Alam et al. (2016)	ARDL	FDI	Life expectancy	Positive
Burns et al. (2017)	OLS	FDI	Adult mortality	Positive

[12] More comprehensive explanation can be found in Appendix 1.

Study	Method	Independent Variable (FDI)	Dependent Variable (Health output)	Effect to Health
Nagel et al. (2015)	GMM	FDI per capita	Infant mortality rate	Both positive and negative
Lenhert et al. (2013)	GMM	FDI/GDP	Life expectancy at birth	Positive
Cao et al. (2017)	Fixed Effect Model	FDI	Adjusted life year	Negative
Steensma and 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

3.2.1.1 Environmental Effect

One channel through which FDI affects health is the environment channel. Elo and Preston (1992), Pope (2000), Pope et al. (2004) present that environmental quality is effective in health and morbidity. It is vital to implement a policy and program to make a distinction among the linkages between environment and health which have two dimensions: diseases caused by environmental risk elements and a specific environmental hazard. Environmental risk factors are polluted water, poor sanitation and hygiene, indoor and urban air pollution, climate change. Disease caused by specific environmental hazards are diarrheal diseases, respiratory infections, viral disease, road traffic injuries, unintentional poisonings (WHO, 2008).

There are many studies on the effect of environmental pollution on health. This section gives a summary of studies examining how FDI inflows acts on pollution, by means of pollution hypotheses after stating the importance of FDI as an indicative of economic growth and development through health especially for developing countries. In the literature, there are two different sights, positive and negative, concerning the effects of FDI on environment: as it has been stated pollution halo and heaven hypothesis. Some studies employ CO_2 emissions to determine pollution. So, we will mention studies examining FDI-CO_2 relations based on Pollution Halo and Pollution Haven Hypotheses.

FDI makes a bridge between the internal resource and savings gap and improves balance of payments in less developed countries. One of the reflections of FDI on economy through health may be raised from environmental pollution. Developing countries, which depend on external financial sources for their economic growth, want to attract FDI, but they need to consider the externalities that these investments can cause during the production process. The efficient use of energy in production course and the use of environmentally friendly energy sources are important in maintaining the environmental quality of the country.

There is a wide selection of literature about FDI and environmental degradation. If FDI is mainly comprised of service sector, it does not create pollution. There are casual relations between FDI and environmental pollution. Air pollution causes bad health conditions. Unhealthy work environment affects labor's productivity negatively. This cycle affects FDI inwards. On the other side of the coin, strict environmental regulations hinder the attraction FDI. Developing countries, needing external finance look for long term foreign sources and FDI, constitute the main item of this phenomenon. In order to draw FDI to the country, some comparative advantages such as executing lax environmental regulations are preferred in developing countries. However, this leads to subsequent environmental pollution. For all these reasons, this thesis is important as it examines relations between FDI and health.

This section reviews the relevant literature on the linkage between FDI and pollution. This relation is based on explaining two contradicting theories such as “Pollution Halo Hypothesis” and “Pollution Haven Hypothesis”. Pollution Halo Hypothesis can be defined as:

> “FDI has a positive effect on natural environment by transferring more efficient and cleaner technologies from developed economies (Hoffman et al., 2005, p. 2)”.

Besides, “Pollution Haven Hypothesis” is defined as:

> “Highly polluting multinationals relocate to countries with weaker environmental standards in order to circumvent costly regulations in their home country and in this way rise pollution levels in host country” (Hoffman et al., 2005, p. 2).

As global warming has reached a significant level, the number of studies questioning the determinants of CO_2 emissions has rapidly raised. Greenhouse gas emissions have been the basic cause of global warming. The effect of FDI on CO_2 emission differs in terms of causing technological development and transferring pollution creating industry. FDI, which makes efficient use of energy through technological development, may reduce CO_2 emissions, on the one side FDI may increase emissions in the host country by enabling the transfer of industry which creates pollution. In addition, it varies with respect to the investor and origin of country.

Pollution Haven Hypothesis has three types. The first one is pushing industries, which are the major source for pollution. The ones from developed countries to less developed countries have flexible environmental regulations. The increase in income per capita stresses environmental quality, which is considered to be luxury consumer goods. Generally, rich countries create pollution heavens by moving their facilities that cause environmental degradation to less developed countries through FDI. Dumping of the waste produced in developed countries to less developed ones is the other way of polluting. Lastly, it may happen by non-renewable garbage in developing countries (Aminu, 2005). In terms of “Pollution Haven Hypothesis”, countries' strict environmental regulations make

production more costly and comparative advantages in production are shifting towards countries that do not make these environmental regulations. Countries whose institutional structure is not developed, turn this situation into an opportunity and prepare a suitable environment for possible FDI.

In global trade, lenient environmental standards give comparative advantage for particularly pollution-intensive goods. “Pollution Halo Hypothesis” states that strict environmental regulations will reduce the polluted industrial density based on technology gap hypothesis. Generally, FDI from less developed countries to most developed countries lead to the creation of the effects of Pollution Halo Hypothesis. According to the Porter hypothesis, firms will reduce their increasing costs through newly developed technologies, which will enable the efficient use of natural resources (Porter, 1995).

As to studies interested in FDI, there are various results changing to the country characteristics, so it is not possible to give a unique policy recommendation. For instance, it is found that FDI in Malaysia, Thailand and the Philippines increase emissions, while in Indonesia the relation is inverse (Merican et al., 2007). Related to research findings, Latin America and the Caribbean, and the Middle East, North Africa, and sub-Saharan Africa, Central Asia, except North Asia should implement more environmental regulation policies to restrict carbon emissions and FDI movements (Omri et al., 2014).

Furthermore, some studies find relation between CO_2 emissions and FDI. For instance, Omri et al. (2014) finds a negative linkage from CO_2 emissions to FDI inflows.

On this basis, we conclude that development is possible if there is a good condition of living environment. The development approach should broadly include both economic growth and quality of environment.

In sum, it is concluded that there is a huge variety of literature about health, pollution, growth and tax policies and they are all related to each other.

3.2.1.2. Income Effect and Intensive Working Effect

The relationship between income and health is found as non-linear in some studies (Burns et al., 2017; Fotourehchi and Caliskan, 2018). Nunnemkamp (2015) explains this situation based on the level of income. Income effect becomes positive for low levels and it has a negative impact on high levels due to intensive working conditions. Between these levels, the amount of effect decreases gradually. This impact can be explained according to the absolute and relative income hypothesis. The absolute income hypothesis depends on diminishing marginal returns for health production function. It improves health nationwide by income transfer from the richer to poorer. On the other hand, the relative income hypothesis states that health is getting worse in a country where there is income difference. This creates a chain effect starting from economic insecurity, which has serious damaging effects on health, and competitive pressure related to FDI to increased worker stress.

FDI and related income gains influences health more in lower income countries compared with the higher ones. As worker income rises, it boosts life standards in addition to life expectancy. However, this effect becomes flat as income soars more and then it leads to little impact on health in higher income countries because of diminishing returns to scale (Nunnemkamp, 2015).

Tran (2005) defines income effect related to improved life standards in a country. This effect changes based on income level. If a country is poor, rise in income affects life standards faster in a better way. However, this link becomes weaker as the income level enhances. For example, in a rich country, improvement in income has little impact on life standards. It is generally related to more stress, longer working hours, less sleep and unhealthy nutrition, which all affect health negatively. In fact, as income soars, self-consciousness on health issues improves. Extra income means ability to afford high quality food such as organic food which contributes to life expectancy. Besides, rise in income leads to higher salary for workers than the ones in domestic firms, which

provides better social services. Income inequality raised from skilled labor having higher salaries than unskilled ones in China is a good example for how competition of foreign owned companies affects domestic work area negatively (Hale and Long, 2011). Income inequality may lead to stress and economic insecurity, harming absolutely health conditions in society.

In this study we call the following impacts as *intensive working effect* of FDI: longer working hours, less social life, more stress, less sleep and unhealthy fast-food nutrition.

In brief, FDI may improve and damage health. The clear effect will change according to the level of income of the country.

3.2.1.3. Infectious Diseases Effect

FDI may cause increased exposure to chronic and infectious disease by marketing unhealthy goods and creating pollution (Smith, 2006).

Azemar and Desbordes (2009) state negative impacts of FDI on health and underline infectious diseases as mentioned in the previous section. They examine the impact of HIV and malaria on FDI inwards and finds that in the absence of these diseases, FDI would be higher in more than one-third of the sub-Saharan African countries. Besides, it occurs more frequently for people who travel for business. Foreign companies make contamination faster. Especially multinational companies lead to the spread of infectious diseases faster. In literature, there are studies investigating the effect of FDI inwards on infectious diseases.

Tandon (2005) mentions the sharp effect of outbreak of serious acute respiratory syndrome on FDI in 2003 in Asia. He makes a distinction among several contaginous diseases such as HIV/AIDS and tuberculosis, whose outbreak decreases human capital, labor productivity, higher non-existence at work and higher expenditures. Especially low level income countries have been

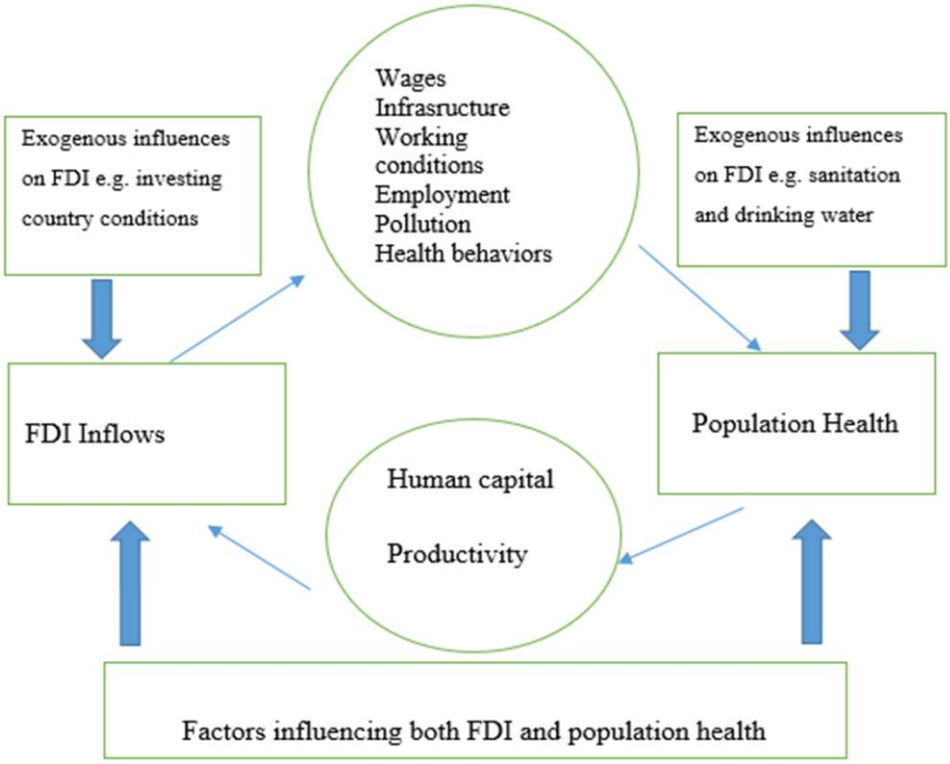
affected severely because their institutions are weaker. Poor health in lower income countries depresses FDI. Foreign investors do not prefer to invest in a country where they have litle information about its investment climate. Therefore, public investments in health should be prior and FDI should be allowed to improve economic growth, employment and poverty reduction.

Nowadays the whole world has been struggling with COVID-19 which originated from China and then around the world including Turkey. This contagious disease harming the respiratory system has led to a global crisis in the world. Since the coronavirus outbreak began, all major airlines have cancelled their flights according to their countries' new pandemic rules. Conferences, technology, trade, shows around the globe are affected by the coronavirus. All the international activities including international trade has been cancelled. Thus, economical effect will be very serious around the globe. Especially foreign trade will be affected mostly. Effects of FDI on outbreak and also effects of outbreak on FDI inwards will be among the most intriguing research items. Therefore, this topic seems to be a popular research, especially in economics in the near future.

3.2.2. Effects of Health on FDI: Source of Endogeneity

There are limited studies investigating bilateral FDI and health relations. 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. To 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 factors affecting both of them simultaneously. It finds some results by examining bilateral relation that 1% increase in FDI to GDP ratio decreases

adult mortality by 0.079% and 1% increase in life expectancy leads to increase FDI to GDP by 0.993%.



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

Figure 5. Framework of the association between FDI and population health

Another study examining bilateral relationship explores the indirect impacts of infectious diseases on FDI in 28 Sub Saharan Africa countries for the period between 1985 and 2004 (Azémar and Desbordes (2009). It explains the effect of health on FDI by human capital. Labor productivity increases FDI inwards. If life expectancy and education soar one-year, net FDI inflows rise by 3% and 16%, respectively. The result indicates that market size primarily affects, education and health which are the other significant factors contributing to it. The indirect effect of infectious diseases on FDI is observed by empirical analysis by calculating direct effect of HIV, malaria and tuberculosis diseases. It

finds when there is no HIV and malaria, net FDI inflows could have been one third higher. Besides, it states that FDI could directly help to enhance health status in the host economies by the way of better social services and safer workplaces. Indirectly, when income level becomes higher, demand for health services increase. If there is competition between the firms, it creates stress and FDI may also induce health negatively in the host economies. As it can be observed in the literature, there are some researches about the effects of health on FDI inward. Most of them have the same findings that good health attracts more FDI and poor health causes a decrease FDI inwards by increasing direct and indirect costs. Alsan (2012) investigates the impact of health on FDI in low- and middle-income countries (LMICs). According to the findings, health is a positive determinant for FDI inflows. Every year gained for life expectancy boosts FDI inflows by 7% among the LMICs between the years 1980 and 2000. This is based on the statement that healthy workforce is important to attract FDI. Education, governance, infrastructure and income per capita are control variables in regression of FDI and health. For robustness, infrastructure and geographic variables are postulated. Bloom et al. (2004) find that one year rise in life expectancy boosts labor productivity by 4%. Especially in developing countries, this significant impact arises from labor costs because training and recruiting new workers are costly (U.S. Agency for International Development, 2001; Bloom et al., 2003). Alsan et al. (2006), who use profit and production function, highlight that health has positive effects on FDI in developing countries. The reason, which is explained by association between FDI and health, is based on a healthy workforce (Alsan et al., 2006; Azémar and Desbordes, 2009). When health becomes poor in a society, it has a reflection on the labor market. The labor costs and health expenditures become higher if there is health matter for the workers in developing countries in contrast to developed ones having more financial sources for new workers' training and wage needs.

The paper of Alsan et al. (2006) explain the large effect of health on FDI from the cost perspective factor which is one of the determinants of FDI. The

relationship is constructed on the workers' productivity. Healthier workers increase productivity in work (Strauss and Thomas, 1998). When good health is widespread, absence in work does not happen often. However, poor health leads to high labor costs and employee compensation.

Giammanco and Gitto (2019) explore the relation between FDI and population health and find a positive impact on FDI for 29 member states of European countries between 2000 and 2013. A healthy life year rises FDI 0.025%. A 1% rise in population health leads to boost in FDI 0.014%.

Kamangaza (2009) studies the impact of FDI on human capital formation in developing countries for the period between 1990 and 2006 in 103 developing countries. The regression result indicates that 2.5% decrease in FDI flow occurs when life expectancy increases 1%. Moreover, higher secondary school enrollment leads to a rise in the FDI flow Talukdar and Parvez (2017) suggests that one year rise in life expectancy leads a 7% growth of FDI inwards in 46 developing economies.

Gövdeli (2019) finds one-way causality from life expectancy to FDI for the period between 1992 and 2016 in country groups including China, India, Brazil, Mexico, Russia, Indonesia and Turkey. However, there is no information about the degree of its impact. The way of causality for economic growth and trade openness on FDI is also investigated in the same study.

Lastly, Anyanwu and Yameogo (2015) find that high life expectancy and FDI inflows are correlated negatively in the sub-region of West Africa. The reason is explained that there is a non-linear linkage for FDI inflows and economic development in Africa. For the period between 1970 and 2010, West Africa is on the left side of this curve.

3.3. OTHER FACTORS AFFECTING HEALTH

In this sub-section, the effect of other control variables on health are reviewed.

3.3.1. Per Capita Income

Growth may both improve and deteriorate health. Lopez-Casasnovas et al. (2005) prove that the poorest countries are the ones that have the worst health status. Granados and Ionides (2008) demonstrate that economic growth leads to health progress in Sweden for the 19th century. In low-income countries, standard of living is an essential part of health. Poor societies cannot afford to buy organic and unhealthy food all the time, which makes them unhealthier than rich people. High income countries have longer working hours leading to less social contact and sleep, higher stress and unhealthy food consumption. According to the figure below, left side reflects low-income countries and right side belongs to higher income countries. Till the maximum level, as the income increases, higher quality goods and services are achieved; education, health and living conditions become better.

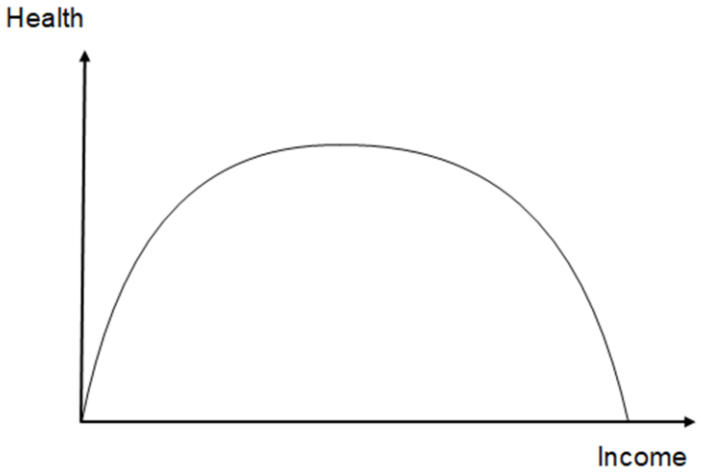


Figure 6. Health and Income

Burns et al. (2017) claim that curve representing the association between income and health is non-linear so relationship between FDI and health may be based on non-linearity. Also, they explain why and how FDI may improve health and also may affect it negatively. Total effect is comprised of aggregating income effect, infectious diseases and environmental impacts. Literature has

both examples. At this point, it is important to reveal earlier findings for Auster et al. (1969) which investigate the impact of lifestyle, medical expenditures, education and income level on mortality. As income increases mortality rises, too. The reasons might be adverse diets, driving faster cars and less exercise. It explains it based on changes in consumption patterns and lifestyle.

3.3.2. Education

Education level in the country is believed to be the indicator of a healthy society. Educated people tend to take up preventive cure and are more successful in following the treatment procedure by getting their drugs on time. Education affects health conditions positively since it is believed that it increases awareness about hygiene, preventive cure and health policies. Moreover, positive developments in life expectancy make it possible to benefit from the return on increasing expenses of human capital for a long time. Life expectancy and investments in education have bilateral relationship. Caner and Yiğit (2019) have a finding that poor health is strongly related to having lower income and education level.

3.3.3. Health Care Expenditure

Impact of health care expenditure on health status is mainly based on the health system, right health policies, awareness of the society, quality of staff in health sector, effectiveness of health-related inputs such as medical facilities trained by technological possibilities and quality of medicines and machines used. In general, it is believed that increase in health care expenditures improve life expectancy. First reason is that health expenditure is an indicator of accessing health facilities since the easier the access, the higher the health care expenditures. Linden and Ray (2017) proves that higher public health expenditures to GDP increase life expectancy. When public expenditure on health boosts one unit, life expectancy increases 0.011% (Levine and Rothman,

2006). Moreover, income level is a main determinant of health expenditures in a country. As the income per capita increases, health expenditures will boost, too.

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 and Çalışkan, 2013).

3.3.4. Trade Openness

Many studies find that trade openness develops health. Firstly, it is possible to improve wellbeing by providing growth with reference to some economists. A 1% increment in trade openness leads to an augmentation in life expectancy by 0.364% (Alam et al., 2016). Owen and Wu (2007) conclude that trade openness raises life expectancy for females by 1.39% years and for males it is 0.84% years in the poorest counties. One-unit increment in trade share increases life expectancy 0.027% in the OECD countries (Levine and Rothman, 2006).

Import of medical goods, health technology and transfer of know-how is another important factor to improve health status in non- research and developing economies. Papageorgiou et al. (2005) test this effect in 73 technology importing countries. It is interesting to note that trade openness does not affect life expectancy for women directly, but it reflects the sector they work.[13] Herzer (2015) shows positive impact of trade on life expectancy for the US in the long period. Stevens et al. (2013) suggest free trade provides better health status in low-income countries.

[13] Bussmann (2009) finds an interesting result for women that trade openness does not affect life expectancy directly, but it reflects the in which they work.

On the other hand, trade may affect health negatively by increasing costs. In fact, this effect may change according to trade partners of the country.

CHAPTER 4:

ANALYSIS

In this section, the effect of FDI on health will be examined in Turkey for the period between 1975 and 2018. Health production function will be generated for this aim. In the following titles, the model to be estimated and the data set to be exerted will be introduced. Then the econometric method to be applied will be explained. Lastly, the model will be estimated, and the results will be evaluated.

4.1. MODEL

Health production function method has been adopted to examine economic, social and environmental impacts of health output in general[14]. In literature, there are many studies examining all effects simultaneously (Thornton, 2002; Tyagi, 2015). This study just uses economic and social vectors. It does not employ vector of environmental variables since it is considered that there is not a substantial indicator showing pollution for the period the study covers in Turkey. Pollution indicators and urbanization data are not sufficient indicators to signal the environmental vectors for Turkey. Besides, this study utilizes macro version based on the same theoretical background. As many empirical studies turn Grossman's theoretical model depended on micro level into macro level, in order not to be far away from the theoretical basement, per capita variables and sub-sectoral indicators of socio-economic and environmental factors are generally preferred (Pinto and Antonia, 2014). However, the appropriate econometric methodology for investigating all these environmental measures, lifestyle and health care expenditure measures and evaluating the estimates

[14] For further information, please see title "Health Production Function" in Chapter 3.

simultaneously is contentious (Shaw et al., 2005). Hence, this study uses per capita values for economic and social variables for the analysis. According to the models mentioned in the previous sections, the model was constructed which is at the following:

$$H = f(Y, S) \quad (4.1)$$

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

$$h = f(y_{1,} y_{2,\ldots} y_{n,} s_1, s_{2,\ldots} s_m) \quad (4.2)$$

“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.

$$\text{The explicit form is } h = \lambda \Pi y_i^{\alpha i} \Pi s_i^{\beta j} \quad (4.3)$$

λ shows initial health stock. For ease of estimation and interpretation, some notations were changed, and the natural logarithmic position of the equation (4.1) was employed.

$$\ln(H) = \ln \beta_0 + \beta_1 \ln(Y) + \beta_2 \ln(SCH) + \beta_3 \ln(FDI) + \beta_4 \ln(EXPN) + \beta_5 \ln(TRA) \quad (4.4)$$

4.2. DATA

This study utilizes time series data for the period between 1975 and 2018 for Turkey for the analysis. Logarithmic forms were applied to make it smooth and easy to interpret. Life expectancy at birth (H) was used for the health status output. Real GDP per capita (Y) was employed for 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 explained below in detail.

4.2.1. Health Status as an Output

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 terms of World Bank's definition (WB, 2021).

Both disease prevalence, incidence, infant mortality, child mortality as health status proxy indicators and the number of workers in health sector, the number of hospital bed, per capita health care worker as well as health expenditures are commonly utilized in the literature as indicators of the health care variables. Nevertheless, studies that are based on life expectancy at birth have gone up in recent years. Life expectancy has been used for health output; because it best represents general health status of society much better in the literature. Life expectancy can be measured technically with respect to all ages and by gender.

This study operates life expectancy at birth which can be defined as the length of life of a newborn person, and this value is equal to the age at the time of death. It is commonly calculated separately in accordance with gender and geographical differences. In this study, gender and geographical difference is not used and life expectancy at birth for total population (years) calculated by World Bank data center is preferred.

4.2.2. Per Capita Real Income

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. It is described as: "GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products". It is

calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Per capita real GDP figure is used because the theoretical background for Grossman Health Model needs per capita values of economic variables. Data for real GDP was obtained from World Bank in 2010 US Dollars.

4.2.3. Education

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. Grossman (1972) argues that analysis becomes stronger if education and income are used as a representer of the socio-economic vectors. Most studies involving the education variable use enrollment rate and years of schooling at different education levels. However, this study does not use interpolation data. It uses number of students per teacher in tertiary education to proxy education. 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, 2019). Also, this variable is prefered 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 was achieved in statistical indicators book (TUIK, 2012). For the period between 2012 and 2014, the data was taken from the book including formal education statistics (Ministry of National Education, 2017). After 2014, the data is available in YOK statistics database.

4.2.4. Foreign Direct Investment

In general, gross flows or net flows are used as common indicators of FDI in the studies. Besides, several studies divide FDI flows by population or GDP. For

example, Burns et al. (2017) use proportion on total FDI such as primary, secondary and tertiary sector investments in order to demonstrate the sectoral differences. Alsan (2012) makes a calculation to acquire gross form of FDI inflows because the data from World Bank does not include it directly. However, we prefer net inflows to GDP using UNCTAD data base for two reasons. First of all, 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 was used in this study.

4.2.5. Health Care Expenditures

Total health expenditure is the sum of public and private health expenditures. They usually include provision of preventive and curative health services, family planning activities, nutritional activities and emergency assistance. It is not preferred to distinguish them in this study because distribution of total expenditures into public and private is not the issue for this study. Therefore, health expenditure per capita through purchasing power parity in OECD databank was used in this study.

4.2.6. Trade Openness

There are many various trade openness criteria adopted by researchers. Among them; the share of exports and imports in GDP, separately or in total trade shares, tariff rates, non-tariff barriers, price-based criteria, export taxes and incentives and composite indices.

Wacziarg (2001) divides trade openness criteria into three general categories. They are output criterion, policy indicators and deviation criterion. The output criterion describes the amount of trade and the components of trade. Policy

indicators are tariff rates, non-tariff barriers and usage rates for protection policies. The deviation criterion is the deviation between estimated amount of free trade and realized trade. In the literature, there are various measures used for trade openness indicator, such as that Chinn and Ito (2008) use different index formed by the share of a five-year window encompassing a new year and the preceding four years that capital controls for trade openness indicator. In terms of comparison to FDI indicator[15], this study employs output criterion that is the sum of exports and imports divided by GDP from the World Bank as trade openness measure.

4.3. ESTIMATION METHOD

New cointegration methods have been proposed recently. This study applies Fully Modified Ordinary Least Squares (FMOLS) which is one of new methods for single equation cointegration. FMOLS is developed by Phillips and Hansen (1990). This method executes a quasi-parametric verification to deal with the matters caused by the long run correlation. The FMOLS estimator is asymptotically unbiased. (Eviews, 2021).

In our study FDI may be correlated to the error term which results from the bilateral relationship between FDI and health. Therefore, in this study, the FDI and health relationship is estimated using FMOLS, DOLS and CCR techniques since they are robust to the endogeneity problem.

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

4.3.1. FMOLS, CCR and DOLS Methods

In our study we have used three methods for a one cointegration vector. These are FMOLS, Canonical Cointegration Regression (CCR) and Dynamic OLS (DOLS). In this section these estimators are explained.

4.3.1.1. FMOLS

The FMOLS estimator uses preliminary estimates of the long-run covariance matrices of the residuals. Consider the *n*+1 dimensional time series vector process (y_t, X_t') with the following cointegrated equation:

$$y_t = X_t'\beta + D_{1t}'\Upsilon_1 + u_{1t} \quad (4.5)$$

where $D_t = (D_{1t}', D_{2t}')'$ are deterministic trend regressors and X_t are stochastic regressors. Note that the *n* and X_t are stochastic regressors are given by the following system of equations:

$$Xt = \Gamma_{21}' D_{1t} + \Gamma_{22}' D_{2t} + \varepsilon_{2t}$$

$$\Delta\varepsilon_{2t} = u_{2t}$$

Firstly, FMOLS procedure estimates the following equation:

$$y_t = X_t'\beta + D_{1t}'\Upsilon_1 + u_{1t} \quad (4.6)$$

Then u_{1t} is obtained as the residuals. u_{2t} may be obtained indirectly by

$$u_{2t} = \Delta\varepsilon_{2t}$$

from the following equations:

$$X_t = \acute{\Gamma}_{21}'D_{1t} + \acute{\Gamma}_{22}'D_{2t} + \varepsilon_{2t} \quad (4.7)$$

$$\Delta X_t = \acute{\Gamma}_{21}{}'\Delta D_{1t} + \acute{\Gamma}_{22}{}'\Delta D_{2t} + u_{2t} \quad (4.8)$$

Ω and λ are covariance matrices for the long run ("Kernel approach with the options of Bartlett Kernel and Newey-West fixed bandwith" in menu) in which the residuals are $u_t = (u_{1t,} u'_{2t})'$. Newey-West fixed bandwith is preferred in order to make corrections if there is autocorrelation. After that a degrees of freedom correction is applied, Ω is estimated by using w_{12} for rescaling the OLS covariance estimations

Then the data becomes:

$$y_t^+ = y_t - w_{12}\, \Omega_{22}^{-1}\, u_2 \quad (4.9)$$

An estimated bias correction term is:

$$\lambda_{12}^{+} = \lambda_{12} - w_{12}\, \Omega_{22}^{-1}\, \lambda_{22} \quad (4.10)$$

FMOLS estimator is

$$\theta = \begin{bmatrix} \beta \\ \Upsilon_1 \end{bmatrix} \left(\sum_{t=2}^{T} Z_t Z_t{}' \right)^{-1} \left(\sum_{t=2}^{T} Z_t y_t^{+} - \mathrm{T} \begin{bmatrix} \lambda_{12}^{+}{}' \\ 0 \end{bmatrix} \right) \quad \text{where} \quad Z_t = (X_t, D_t{}')' \quad (4.11)$$

Scalar estimator is:

$$w_{12}^{+} = w_{11} - w_{12}\, \Omega_{22}^{-1}\, w_{21} \quad (4.12)$$

With reference to Hansen (1992), The null hypothesis including Wald statistic is:

$$R\theta = r \quad (4.13)$$

$$W = (R\theta - \mathrm{r})'(RV(\theta)\mathrm{R}')^{-1}(\mathrm{R}\theta - \mathrm{r}) \quad (4.14)$$

$$\mathrm{V}(\theta) = w_{12} \left(\sum_{t=2}^{T} Z_t Z_t{}' \right)^{-1} \quad (4.15)$$

In the literature, some studies adopt superiority of FMOLS whereas there are those that argue DOLS is better. Both FMOLS and DOLS make estimation for the long run. In small samples such as a five-year panel data, consistent result has been achieved with FMOLS (Breitung, 2005).

4.3.1.2. CCR

Canonical Cointegration Regression (CCR) is proposed by Park (1992). CCR is related to FMOLS estimator. The difference is to use stationary transformations of the $(y_{1t,}X_t')$ to get least squares estimates to eliminate the long-term dependence between the cointegrating equation and stochastic regressors innovations.

The first step is to estimate the innovations:

$$u_t = (u_{1t,}u_{2t}')' \tag{4.16}$$

and corresponding consistent long-run covariance matrices Ω and λ .

We extract the columns of λ corresponding to the long-run covariance matrix of u_t and u_{2t} .

$$\lambda_2=\begin{bmatrix}\lambda_{12}\\ \lambda_{22}\end{bmatrix} \tag{4.17}$$

Then $(y_{1t,}X_t')$ is transformed using

$$X_t^* = X_t - (\sum^{-1}\lambda_2)' u_t \tag{4.18}$$

$$y_t^* = y_t - (\sum^{-1}\lambda_2\beta + \begin{bmatrix}0\\ \Omega_{22}^{-1}w_{21}\end{bmatrix})' u_t \tag{4.19}$$

where the β are estimates of the cointegrating equation coefficients. The CCR estimator is defined as the OLS estimator which is applied to the transformed data

$$\begin{bmatrix} \beta \\ \Upsilon_1 \end{bmatrix} = \left(\sum_{t=1}^{T} Z_t^* \; Z_t^{*\prime} \right)^{-1} \; \sum_{t=1}^{T} Z_t^* \; y_t^* \tag{4.20}$$

where $Z_t^* = (Z_t^{*\prime}, D_{1t}^{*\prime})'$.

The CCR transformations asymptotically eliminate the endogeneity caused by the long run correlation of the cointegrating equation errors and the stochastic regressors innovations (Park, 1992). The transformations simultaneously correct for asymptotic bias resulting from the contemporaneous correlation between the regression and stochastic explanatory variables errors. The CCR estimates are fully efficient and have the same unbiased, mixture normal asymptotics as FMOLS.

4.3.1.3. DOLS

Another approach to construct an asymptotically efficient estimator that eliminates the feedback in the cointegrating system has been proposed by Saikkonen (1992) and Stock and Watson (1993). The method is named Dynamic OLS (DOLS). The DOLS method involves augmenting the cointegrating regression with lags and leads of ΔX_t so that the resulting cointegrating equation error term is orthogonal to the entire history of the stochastic explanatory variable errors:

$$y_t = X_t' \beta + D_{1t}' \Upsilon_1 + \sum_{j=-q}^{r} X_{t+j}' \delta + v_{1t} \tag{4.21}$$

Under the assumption that adding q lags and r leads of the differenced explanatory variables soaks up all of the long-run correlation between u_{1t} and u_{2t}, OLS estimates of $\theta = (\beta', \Upsilon')'$ using Equation (4.10) have the same asymptotic distribution as those obtained from FMOLS and CCR.

4.3.2. Stationary Conditions and Superiority in FMOLS

FMOLS has a superiority changing least squares to overcome with serial correlation problem and the endogeneity caused by cointegration. Besides, FMOLS estimates have slightly different point estimates, but they have much larger standard errors (Eruygur, 2019). Its common specialty is that it is depended on the condition that series are stationary at I (1). This technique is operated to find out the robustness of the primary results of long run coefficients. Eviews-10 is applied for the analysis. In the menu section, Newey-West option presents to avoid autocorrelation, and this includes heteroscedasticity autocorrelation consistent option which helps to make correction for endogeneity.

Stationarity conditions are checked in terms of set of rules. ADF (Augmented Dickey Fuller), DF GLS (Dickey-Fuller Generalized Least Squares), PP (Phillips-Perron) tests have the same null hypotheses stating the series is not stationary. Until the condition provides that p is smaller than 0.05 or test statistic is more negative than critical value, it has been rejected. Besides, ADF test statistics must be negative.

In order to check robustness of ADF, DF GLS and PP tests, another test is executed which is Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. It has the inverse of null hypotheses stating that data set is stationary. The null hypothesis is accepted until it provides absolute values of LM stat that are smaller than absolute values of critic value. It makes unit root testing more robust. Breakpoint unit root test has null hypothesis stating that the series is not stationary. Until the test statistics is more negative than critical value, it must be rejected. For innovational and outlier break options level is checked. Lastly, Kapetanios test which has the same null hypothesis with the former one is applied.

4.4. ESTIMATION

This study uses Eviews 10 for executing unit root tests and FMOLS analysis. Besides it uses Gretl for Kapetanios test. Results in summary tables with Eviews output are set in the appendix section (Appendix 2 and 3). FMOLS method can be practised providing that variables are stationary for the first level. If a time series occurs stationary when its first difference is taken, it is integrated with the first degree which is shown as I(1) (Gujarati, 2006, p. 720-721). In fact, stationary is not as the same as statement not including unit root. In concept, if series doesn't contain unit root, it is weakly dependent which is represented as I(0).

Linear unit root tests are common in literature. This study executes Augmented Dickey Fuller (ADF) test, DF–GLS which is a form of Dickey-Fuller test statistic using a generalized least squares (GLS) rationale, Phillips-Perron (PP) and KPSS as traditional linear unit root tests. When structural changes caused by internal or external shocks produce biased results in time series, non-stationary series may exhibit stationary properties (Perron, 1989, p. 1361-63). In order to overcome the drawbacks mentioned structural changes, this study performs structural break unit root tests such as breakpoint unit root test and Kapetanios test.

Time series data is one of the main data types performed in econometric applications. The essential assumption is stationarity which can be defined as a process not carrying any trend effect, having constant average and variance and having covariance which is dependent on not period differences. For weakly dependent, the conditions are below.

$$\mathrm{E}[\mathrm{Y_t}] = \mu \tag{4.22}$$

$$\mathrm{var}[\mathrm{Y_t}] = \sigma^2 \tag{4.23}$$

$$\mathrm{cov}[\mathrm{Y_t}, \mathrm{Y_{t+n}}] = \mathrm{cov}[\mathrm{Y_t}, \mathrm{Y_{t+m}}] \tag{4.24}$$

Besides these conditions, when it provides that $Y(t_1), Y(t_2), \dots, Y(t_n)$ have the same distribution for each n and k values with $Y(t_{1+k}), Y(t_{2+k}), \dots, Y(t_{n+k})$, it can be defined as strong dependent probability process.

Random walk process is one of the data generating process defining non-stationary in time series. ADF test is commonly carried out for unit root test process by adding delayed regards of dependent variable.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (4.25)$$

There are three types of random walk:

i.) Random walk

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad (4.26)$$

ii.) Random walk with drift

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + u_t \quad (4.27)$$

iii.) Random walk with drift around a stochastic trend

$$\Delta Y_t = \beta_1 + +\beta_2 t + \delta Y_{t-1} + u_t \quad (4.28)$$

where t represents trend variable. If the null hypothesis is that δ = 0; that is, there is a unit root, and the time series is nonstationary. When the alternative hypothesis is that δ is less than zero; that is, the series is stationary. If the null hypothesis is diclaimed, it amounts to that Y_t is stationary. Besides, t statistic (calculated) must be negative to evaluate it.

Dickey-Fuller Test with GLS redirection (DFGLS) was devised by Elliot, Rothenberg and Stock in 1996. It is more persuasive than ADF test. It enables two forms with trend and without trend. Calculated DF-GLS test statistics is compatible with DF distribution only when there is just a constant term.

$$\Delta X_t = \alpha_0 + \beta\, t + p\, X_{t-1} + \sum_{i=1}^{k} \beta_i \Delta X_{t-i} + \varepsilon_t \quad (4.29)$$

$$\Delta X_t = p\, X_{t-1}^{d} + \sum_{i=1}^{k} \beta_i \Delta X_{t-1}^{d} + \varepsilon_t \quad (4.30)$$

PP unit root test executes nonparametric model to consider the serial correlation problem in the error terms, however it doesn't use lagged difference terms. PP unit root test estimates DF equation and make arrangements in t test statistics. PP unit root test has the same asymptotic pattern of ADF test. This test is more powerful to disclaim null hypothesis which is false.

KPSS test was developed in 1992. The null hypothesis states that the series is stationary. KPSS test is unusual with the null hypothesis of trend stationarity. It uses the following Langrange multiplier statistic:

$$LM = \frac{\sum_{i=1} S_i\,(t)^2}{T^2\, f_0} \quad (4.31)$$

where $S_i\,(t)$ is the cumulative residual function, f_0 is the estimator for residual spectrum at zero frequency. The test is established regarding the explanatory variable and includes constant and deterministic trend.

According to Perron and Vogelsang (1992) and Perron (1997), unit root testing under structural break is essential in time series. The first unit root test under structural break is Perron's unit root test (Perron, 1989) which allows only for one break point. There are four models which are one-time switch in level for non-trending time; change in level, change in both level and trend and lastly alternating in trend for trending data. In addition, there are two options which are the innovational outlier model assuming the break gradually and additive outlier in which the break occurs immediately.

The test proposed by Kapetanios is an improved version of Zivot and Andrews (1992). It allows for up to 5 breaks whilst the Eviews's breakpoint unit root test allows for only one break. That is why, in this study, using Gretl software the Kapetanios unit root test is also carried out. The test asks the maximum number

of lags (the code then chooses the optimal number using Perron's backward significant t-ratio) and the trimming parameter, which is the number of observation (as percentage of the sample size) that must be forced between the breaks and endpoints of the sample size. The structural break forms allowed are: “only level breaks”, “only trend breaks” and “both level and trend breaks”. The output of the test reports the test statistic, the statistical decision for 1%, 5% or 10% critical values and the break dates.

4.4.1. Results for Linear and Structural Unit Root Tests

Firstly, the logarithm of six time series data variables were taken and then traditional linear unit root tests and then structural break unit root tests were executed. Augmented Dickey Fuller test, DF GLS test, Phillips Perron test were applied for stationary, since the null hypotheses of the tests include that the data set is not stationary. Therefore, KPSS test, which has the inverse of those null hypotheses, was applied to check the robustness of their results. Moreover, breakpoint unit root test and Kapetanios test were carried out to consider structural breaks if there are. All the series are found to be stationary at the first level as it can be followed in Table 4. In other words, all the series (in level) are found to be integrated of order one, i.e. I(1). This implies that data is appropriate to apply for FMOLS estimation procedure.

After taking the logarithms for each variable, graphs were drawn and it was decided which random walk was suitable among pure random walk, random walk with drift, random walk with drift and trend (Appendix 6). Eviews 10 menu enables the user options for none, intercept, trend and intercept. ADF, DF GLS, PP, KPSS and breakpoint unit root test were applied through Eviews 10 and then Kapetanios test was carried out via the Gretl software.

In the beginning, the logarithm form of all the variables were graphed and then it was decided which random walk for each of them. They were found to be “random walk with drift” after evaluating their graphs. For all the variables except

life expectancy at birth, “intercept form” was practised when ADF, DF GLS, PP, KPSS and breakpoint unit root tests were applied. Due to life expectancy at birth had a nonlinear trend while executing traditional unit root tests and breakpoint unit root tests, “random walk with drift around a stochastic trend” option was selected which indicated trend. For life expectancy at birth, ADF test for random walk with drift and trend was carried out. However, the coefficient was found to be positive. If a positive ADF test statistic is obtained this points out a mistake in the selected form of random walk, that is why, this test is not interpreted (Asteriou and Hall, 2011). Therefore, DF-GLS with drift and trend specification is used. For other variables, firstly ADF test had been executed and then it was considered that DF-GLS test results confirmed ADF test. However, the only variable that does not give information about stationarity was DF-GLS test result for FDI. After that, it was revealed that PP and KPSS results supported the other results. In Kapetanious test, “Only DU” which means level break was implemented. Level break (only DU means there is structural break in constant term) option was selected for all variables except life expectancy at birth, in which only trend option (only DT means there is structural break in trend) was employed because of its trend movement.

Table 4. Unitroot Tests

VARIABLE (LN)	ADF	DF GLS	PP	KPSS	BREAK POINT UNIT ROOT TEST	KAPETANIOS
H	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Y	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
SCH	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
FDI	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
EXPN	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
TRA	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Author’s Estimations

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

4.4.2. Results for FMOLS

In Eviews 10 menu, several arrangements had been adopted. In the analysis, trend specification was chosen as constant (level), lag specification was auto AIC, Newey-West option was selected in Kernel options.

Furthermore, dummy variable was generated for the year 1984 and the afterwards. Since Turkey has entered a different era in 1984 in terms of openness of the economy. The Central Bank of the Republic of Turkey calls 1984 and the following years as the years in which the open economic policies have been adopted (Erçel, 1998 and Güven, 2008). Although the analysis results don't indicate a structural break of Turkey's economy, dummy variable for 1984 was added to the model to control the possible impact of the transformation on the predicted model and then the model had been estimated once again. The dummy variable was formed as 1 for 1984 and afterwards, before 1984 it is zero. Analysis results show that dummy variable is significant at 0.05 level of significance.

Table 5. 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

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

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 long-term coefficients of the predicted model are statistically significant. According to the table showing coefficients, a 1% rise in FDI inflows causes a decrease of approximately 0.004% in life expectancy at birth. In literature, there are some studies presenting the effect of FDI on health is negative in which the coefficients are smaller than zero (Herzer and Nunnunkamp (2012), Stephens (2016), Steensma and 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. For the life expectancy to increase 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 since there has been a consensus among developed countries that life expectancy has reached top point. In Turkey, 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 relation between the number of students per teacher and life expectancy. It means that improvement in quality in education has improved health. For the life expectancy to increase 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% soar 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 and hence it soars life expectancy. For the life expectancy to increase by 1 month, the trade / GDP ratio should increase by 4.7%. For example, an increase of 4.7% in this ratio meant an increase from 60.16% to 63% in 2018.

4.4.3. Cointegration Test

Phillips-Ouliaris cointegration test were employed for FMOLS equation. The null hypothesis states that there is no cointegration. As for that result, probability values are smaller than 0.05 which signals there is cointegration by rejecting the null hypothesis. Table 6 and 7 show cointegration test results for Phillips-Ouliaris cointegration tests.

Table 6. Cointegration test: Phillips-Ouliaris

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

Source: Author's Calculations

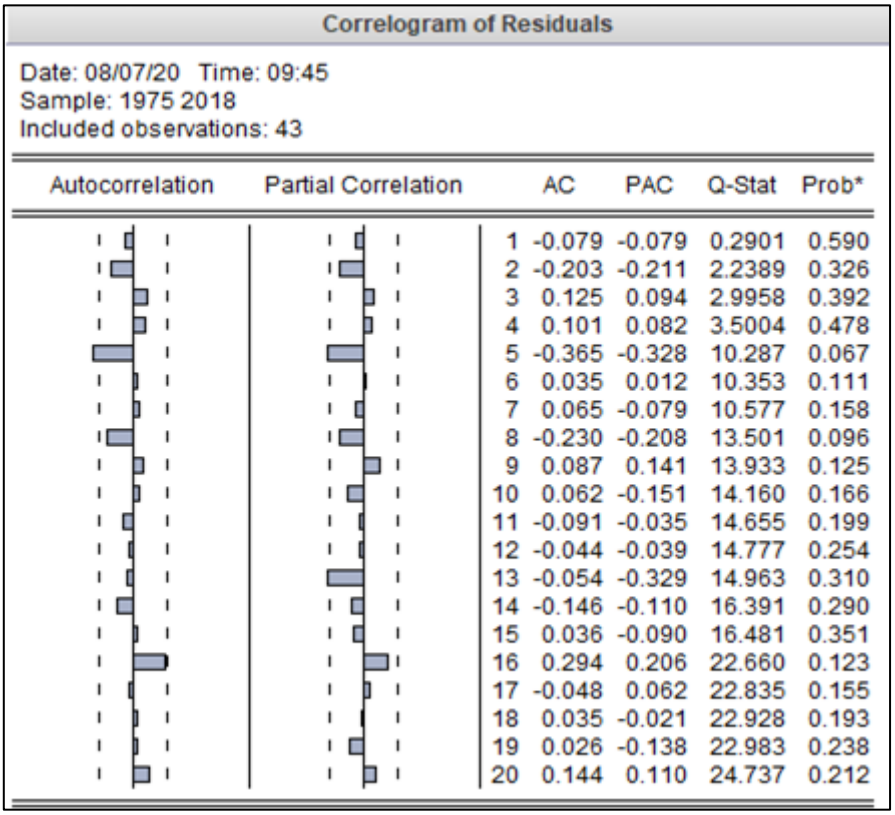
Table 7. Phillips-Ouliaris Test Equation

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

Source: Author's Calculations

4.4.4. Serial Correlation

In order to determine if there is serial correlation, Eviews menu allows looking for correlogram of residuals and correlogram of residuals squared. The null hypothesis states that there is no autocorrelation matter. As for that result, probability values are more than 0.05 which signals there is no autocorrelation matter by accepting the null hypothesis.



Correlogram of Residuals

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

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.079	-0.079	0.2901	0.590
		2	-0.203	-0.211	2.2389	0.326
		3	0.125	0.094	2.9958	0.392
		4	0.101	0.082	3.5004	0.478
		5	-0.365	-0.328	10.287	0.067
		6	0.035	0.012	10.353	0.111
		7	0.065	-0.079	10.577	0.158
		8	-0.230	-0.208	13.501	0.096
		9	0.087	0.141	13.933	0.125
		10	0.062	-0.151	14.160	0.166
		11	-0.091	-0.035	14.655	0.199
		12	-0.044	-0.039	14.777	0.254
		13	-0.054	-0.329	14.963	0.310
		14	-0.146	-0.110	16.391	0.290
		15	0.036	-0.090	16.481	0.351
		16	0.294	0.206	22.660	0.123
		17	-0.048	0.062	22.835	0.155
		18	0.035	-0.021	22.928	0.193
		19	0.026	-0.138	22.983	0.238
		20	0.144	0.110	24.737	0.212

Figure 7. Results for Correlogram of Residuals

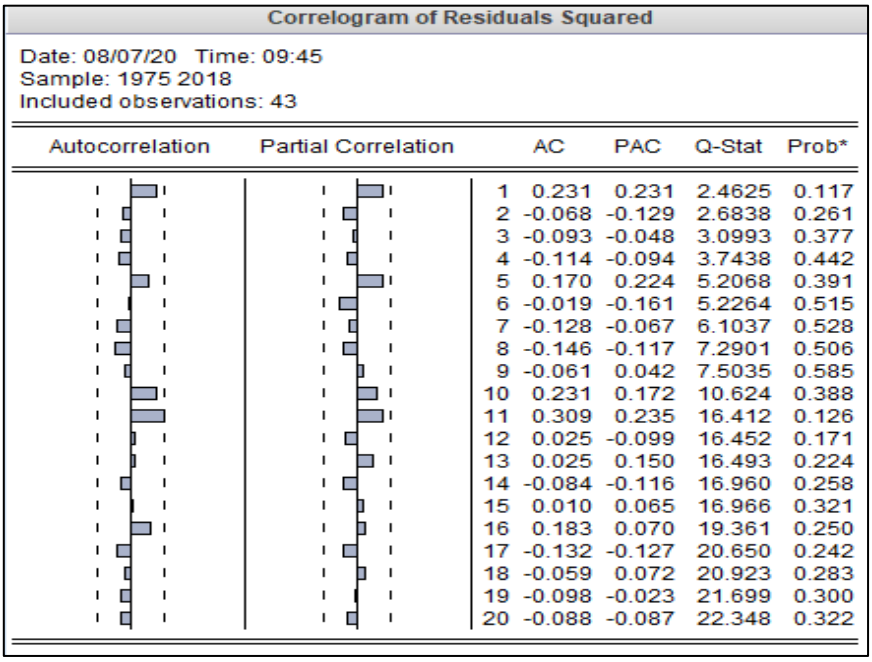


Figure 8. Correlogram of Residuals Squared

4.4.5. Normality

Jarque-Bera (JB) test is applied for normality test in residuals. The null hypothesis states that there is normality. If p value is more than 0.05, null hypothesis is accepted. As it is seen in the table, probability is 0.2175 which signals residuals have normal distribution.

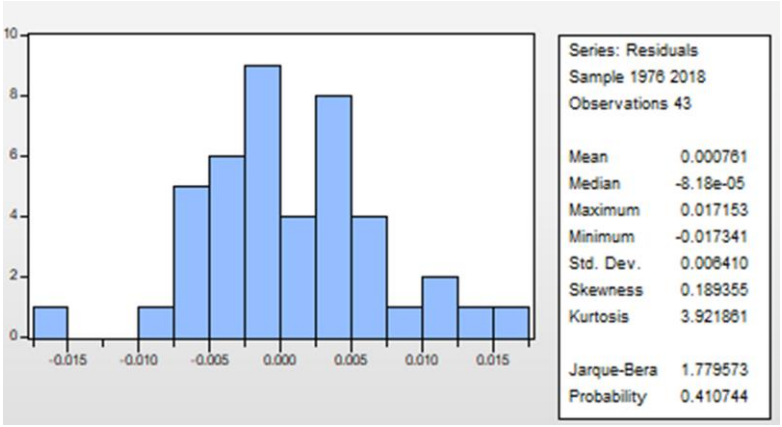


Figure 9. Normality Test

4.5. ROBUSTNESS CHECK

The results for coefficients are compatible with the literature. In order to check the robustness of analysis, two methods were used; one of which is changing the period and the other one is to execute other single equation cointegration methods such as DOLS and CCR.

4.5.1. Period Change

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 changing the analysis period.

Table 8. 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: Author's Calculations

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.

Analysis results, serial correlation and normality results in summary tables with Eviews output are set in the appendix section (Appendix 4).

4.5.2. Estimation Results for DOLS and CCR

Another robustness check is provided by the other two estimation methods. Results are as follows: probability values for the variable of education indicator[16] are more than 0.05; it is resulted from having higher t-statistics and small variances while estimating these coefficients via those methods.

Table 9. DOLS and CCR Results

DOLS			**CCR**		
Variable	**Coefficient**	**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: Author's Calculations

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.

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

According to these results it is observed that the coefficients are not changing seriously. Serial correlation and normality results for DOLS and CCR analysis in summary tables with Eviews output are set in the appendix section (Appendix 5).

CHAPTER 5:

CONCLUSION

Developing countries may require foreign assets such as foreign aid, foreign debt and FDI to achieve sustainable growth and development since their saving rates are extremely low unlike developed countries. An easy strategy for mitigating the savings gap may be to import foreign savings. For this purpose, FDI can be seen as the most permanent solution and it could make the greatest contribution to growth in development path since it may generate learning-by-doing type technological spillover effects. In the literature, the impact of FDI on growth is generally found to be significantly positive especially for developing countries. FDI may also improve the productivity by increasing the human capital due to learning-by-doing type effects. In fact, the productivity growth due to FDI may happen through different channels. FDI could enhance growth and development by bringing research and development activities, increasing employment, facilitating the accumulation of physical capital, and finally bringing know-how (learning-by-doing) and high technology. For all these reasons, the developing countries try to attract FDI particularly for the sectors they want to develop. Labor with higher human capital and skill provide business-friendly environment for production. The creation of business-friendly environments may further attract FDI into the country. On the other hand, the confidential investment ambience and sustainable economic conditions are essential points for encouraging foreign investments.

In the most of developing countries such as Turkey, some hereditary current account deficit problems are observed and, hence, for these countries foreign capital requirement becomes more important compared to the developed countries. Therefore, especially in the long run, this issue needs to be solved for these countries. Throughout this process, higher FDI, foreign borrowing and foreign aid can be seen as the possible options to compensate the investment gaps of developing countries. Among them, due to its effectiveness FDI is

stated as the most prominent way to reduce this gap. At this point, social, political and economic stability of the country plays a crucial role.

FDI has generally positive spillover effects such as higher productivity and capital stock on the host countries. An effective use of FDI within the economy could also increase production, export, employment, human capital, management skills and competitiveness.

At this point, growth models are offering insights. FDI as a part of physical capital is evaluated as the main trigger factor of economic growth in neoclassical growth models whereas in endogenous growth models FDI may affect the growth through its impacts on human capital (Lucas, 1988), R&D (Romer, 1986) and learning-by-doing (Arrow, 1962) processes. On the other hand, in the literature, the impact of health on growth has not been given a clear emphasis. In the growth models, this impact discusses mainly throughout its relationship with the human capital. Health can be seen a kind of human capital and also a necessary requirement to generate other forms of human capital. Ill health could lower not only the ability to work productively but also the ability and incentives to invest in human capital. Sickness and ill health together with the risk of death, in fact, shape and limit the human capabilities and behavior which are the main components of human capital. Therefore, health as a kind of human capital is essential for economic growth and development in the long run. Healthy person means healthy society and healthy labor force soars total factor productivity. On the other hand, bad health status leads to loss of labor and increase in employers' costs and, hence, may decrease the economic output and growth. The correlation between health status and economic output can be described as an example of circular causation: health affects total output and total output affects health and so on. Since FDI is an important component of total output, the same bilateral causality is also valid between FDI and health status: health affects total output and hence the need of FDI, and FDI affects health throughout its impact on total output. Due to its importance of health on growth and development process, this study aims to investigate the effect of FDI

(which is also an important factor for developing countries' growth process and development path) on health by considering the aforementioned bilateral causality (which creates the "endogeneity" problem in econometric estimations) between them.

Burns et al. (2017)[17] studies endogeneity relationship between FDI and health for LMICs. It claims this mutual relationship occurs by different ways such as wage, working conditions, health behaviors, pollution, productivity and human capital. Interestingly, the effect of FDI on health status have had little attention so far in academic literature although both health and FDI are essential in the growth and development path. For this reason, the effect of FDI on health is investigated in this thesis study.

The first element distinguishes this thesis from literature is to analyze the impact of FDI on health for Turkey. In the literature, this relationship has been investigated in a limited number of studies. There are some studies covering the data of Turkey, which commonly analyses some factors that affect life expectancy by using health production function. However, as far as we know, no study has investigated the effect of FDI on life expectancy of Turkey using the health production function approach. The second element distinguishing this study from the literature is the use of estimation techniques which are robust to the endogeneity problem expected to happen between health and FDI for the reasons discussed in the previous paragraphs. To deal with the possible endogeneity problem between FDI and health, this study adopts three cointegrating estimation methods which are robust to this problem: Fully Modified OLS (FMOLS) of Hansen (1992), Dynamic OLS (DOLS) of Stock and Watson (1993) and Canonical Cointegrating Regression (CCR) estimator of Park (1992). In the study, the FMOLS operates as the baseline model and the

[17] It is one of the few studies investigating this endogeneity relationship in the literature.

other two cointegrating models (DOLS and CCR) are used to check the sensitivity of the results. Hence, 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 Turkey.

The data set used in this study also differs from the others. This study uses life expectancy at birth as health output in accordance with common literature. Most of the studies with education explanatory variable in the literature use the schooling rate data in different education levels. Due to lack of data, both the calculation and completion of the schooling rate and school enrollment series for Turkey are obtained from interpolations. Since these series are obtained by interpolation methods, this study adopts the number of students per teacher ratio at tertiary education to represent the educational social factor affecting the health because this ratio can be calculated based on reel observed data without any interpolations. The variable “number of students per teacher in tertiary education” for representing education quality does not refer health status for all the society, but it presents education quality for labor force. Also the aim for using this variable is to take into account the institutional factors besides social capital.

The other control variable of that kind is – the real GDP per capita which is aimed to reflect the economic factors affecting health. In our study, the reel GDP per capita based on purchasing power parity (PPP) is preferred. In addition, the factors that determine life expectancy such as trade openness (ratio of the sum of exports and imports to GDP) and health expenditures per capita are included into the analysis as other necessary control variables. In the literature, CO_2 emissions are used as an indicator for urbanization, industrialization and environmental pollution. However, the amount of particulate matter in the air is the most appropriate indicator for investigating the relationship between health and pollution. Because of data limitations for the period this study covers, it is not possible to use an essential indicator for environmental factors.

We cannot directly compare the estimated coefficients obtained in international studies to the estimated coefficients of this study since many studies use different variables for both dependent and explanatory 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 an increase in FDI inflows has negatively 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 and Nunnunkamp (2012), Stephens (2016), Steensma and 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 Turkey, a 31% increase in FDI inflows causes one-month decrease in life expectancy. This figure 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 Turkey. However, notice 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.

According to the results, all long-term coefficients of the predicted model are statistically significant. Main findings point out that for the life expectancy to increase by 1 month in Turkey: (1) the FDI/GDP ratio needs to decrease by 31%[18], (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)

[18] For Turkey, 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.

the health expenditure per capita needs to increase by around 1.8%, and finally (5) the trade/GDP ratio should increase by 4.7%[19].

Increase in access to education and higher 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 use 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 variable 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 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, increment in access to health facilities by the development of social security systems lead to a rise in health expenditure. 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.

In the literature, two types of findings are observed on this issue: FDI may impose both positive and negative effects on health. FDI may impact health negatively by way of pollution, infectious diseases and more stress, malnutrition caused by intensive working effect. However, FDI may effect health positively by increasing life standards that make better health conditions by providing more accessibility for health facilities. Total net effect is calculated by the sum of these opposite impacts.

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[19] For Turkey, 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%.

Positive impacts of FDI on health status are mainly explained by the increases in income level. It is well known that rises in income may lead to higher life expectancy when it can increase life standards in that country. On the other hand, if higher income results from intensive working conditions (i.e. longer working hours, less social life, more stress, less sleep, and unhealthy fast-food nutrition), higher income may lead to negative impacts on health status. In our study, we call these negative impacts as *intensive working effect* of FDI. Hence, the negative impacts of FDI on health can be caused by, intensive working effect, environment effect (pollution etc.) and infectious diseases. Our estimation results show that for Turkey the negative effects overweight the positive impacts of FDI on health. The negative impact of FDI/GDP ratio on life expectancy is also supported by some studies in the literature (Herzer and Nunnunkamp, 2012; Stephens, 2016; Steensma and Reiter, 2010; Cao et al., 2017; Gökmenoğlu et al., 2018; and Johnson, 1997).

The reasons of the negative impact of FDI/GDP ratio on life expectancy in Turkey can be explained by the arguments of the Kuznets curve. According to Kuznets curve, the environmental problems and income inequality may increase in the early stages of growth. It supports our study's result why the net positive effects of foreign direct investment on health status may not realize. In addition, Fotourehchi and Çalışkan (2018) analyze the relationship between economic growth and health status under the Kuznets curve (KC) hypothesis for 60 developing countries during the period 1995 to 2010 applying panel data methods to a health production function model. Although Fotourehchi and Çalışkan (2018) state that there is no specific Health Kuznets Curve (HKC) for health status they also found *statistically significant non-linearities between health status and economic growth*. This non-linear relationship may help to explain our finding of negative FDI impacts on health status for Turkey. Notice also that, contrary to the homogeneous panel data study of Fotourehchi and Çalışkan (2018), which is carried out for the pool of 60 developing countries, our study is focused only on Turkey and uses time series data and estimation

methods. Lastly, our study focuses on the individual impacts of FDI investments on health status, and therefore, provides FDI specific results.

As the literature research reveals, several papers investigating developing countries have some findings from the side of pollution haven hypothesis[20] which means FDI leads increase in environmental degradation. Most of them focused on the environmental regulation stringency differences to decrease pollution in developing countries which are exposed to pollution coming from foreign developed ones. Pollution haven hypothesis is common in low-income countries, while pollution halo and scale effect are come across in middle- and high-income countries because they can afford these regulations (Hoffmann et al., 2005). If the pollution haven hypothesis is valid for Turkey[21], some pollution decreasing policies should be carried out such like imposing environmental taxes that prevents pollution generated by the multinational companies. The composition of FDI inflows and which industry is causing pollution should be determined to overcome these pollution matters (Mutafoğlu, 2012). 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. In order to reduce the risks on public health and environment and to increase efficiency, it is important to reduce the overuse of energy and raw materials for production processes, reduce toxic substances and negative external effects by preferring environmentally friendly actions. Besides since the environmental issue is an international public good, in terms of compliance with international standards; facility audit, environmental impact audit, waste audit should be carried out by companies and relevant ministries. Government

[20] According to Pollution Haven Hypothesis, FDI inflows may increase pollution in the host country.

[21] Mutafoğlu (2012) finds the validity of pollution-haven hypothesis by investigating the relationships among FDI inwards, CO2 emissions and growth over the period of 1987-2009 for quarterly.

support should be provided for the transition to new regulations protecting the environment. However, in the period covered by the study, there is no important indicator to measure the pollution impact of foreign direct investments. Therefore, we cannot clearly argue that this is due to the pollution effect.

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 Turkey. 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.

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. With the realization of foreign direct investments in productive areas, the share of greenfield investments increases and it provides more employment which contributes to decrease in income inequality.

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

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APPENDIX 1: STUDIES INVESTIGATING RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT AND HEALTH

Table 10. Studies for FDI-Health

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Burns et al. (2017)	Panel	1974-2012, 86 LMIC	OLS	Model 1 : FDI, Model 2: Life expectancy	Model 1: Life expectancy, Model 2 : FDI	1% increase in FDI to GDP ratio decreases adult mortality 0.079% and 1% increase in life expectancy leads to increase FDI to GDP 0.993%.between 1974 and 2012.
Nagel et al. (2015)	Panel	1980-2011, 179 countries (different pc income countries)	GMM	Infant mortality rate	FDIpc, GDPpc school, population, malnutrition, sanitaiton, health expenditure pc, gini, institution variables	FDI has a positive effect on health at low levels and becomes increasingly negative at higher levels of income.
Alsan (2012)/Alsan and Blood (2006)	Panel	1980-2000, 75 industrialized and developing countries	OLS	Gross FDI inflows	Total population, GDP pc in base year, openness, bureaucratic quality, corruption in government, life expectancy, education, telephones per 1000 capita, distance to major markets, population coastal (%)	Every year of life expectancy incresases FDI inflows by about 7 %.

Table 10. Studies for FDI-Health (Cont.)

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Herzer and Nunnunkamp (2012)	Panel	1970-2009, 15 countries	DOLS	Life Expectancy	FDI	An increase in the FDI-to-GDP ratio by one percentage point leads to a decrease in life expectancy of 0.028 years.
Azemar and Desbordes (2009)	Panel	1985-2004, 70 developing countries including 28 from Sub-Saharan Africa.	Fixed Effect Model	GDP pc, Undernourishment prevalence, Safe water access, Education, HIV prevalence, Malaria risk, Tuberculosis incidence, FDI	Life expectancy	Raising life expectancy by one year substantially increases net FDI inflows by 3 %.
Johnson (1997)	Panel	1967-1973, 67 developing countries	Fixed Effect Model	Infant mortality rate	GNP pc, MNC penetration	MNC has a detrimental effect on infant mortality reduction.

Table 10. Studies for FDI-Health (Cont.)

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Alam et al. (2016)	Time series	1972-2013, Pakistan	ARDL	Life expectancy	Trade openness, FDI	A 1 % increase in FDI improves life expectancy by 0.159% keeping other things constant.
Anyanwu and Yameogo (2015)	Panel	1970-2010, West Africa	OLS, GMM	Current FDI inflows	Macroeconomic condition, political and institutional variables, trade openness, natural resource endoxment, market size, human capital (measured by life expectancy), foreign aid (net offical development assistance), past FDI inflows.	High life expectancy tends to have a negative and significant impact on FDI inflows to the sub-region.
Stephens (2016)	Panel	1985-2010, 125 less developed countries	Fixed Effect Model	Model 1 : Life expectancy Model 2 : Infant mortality	FDI concentration	FDI concentration decreases life expectancy in Asian countries.

Table 10. Studies for FDI-Health (Cont.)

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Firebaugh and Becki (1994)	Panel	1965-1988, 62 less developed countries	Difference of log models	Life expectancy at age 1 women/men	Foreign investment as percent of GDP, GNP pc, percent enrolled in secondary school, exports as percent of GDP	When foreign investment as percent of GDP increases 1%, female/male life expectancy at age 1 increases 0.18 %.
Giammanco and Gitto (2019)	Panel	2000-2013, 29 member states of European Countries	GLS	Model 1 : FDI Model 2 : FDI	Model 1 : Healthy life year Model 2 : Population health	Population health and healthy life year variables have a positive and significant impact on FDI. A healthy life year increases FDI 0.025 %. 1 % increase in Population health leads to increase in FDI 0.014 %.
Lenhert et al. (2013)	Panel	1997-2007, 150 countries	GMM	Model 1 : Life expectancy at birth Model 2 : HDI index Model 3 : Education index Model 4 : GDP index Model 5 : Knowledge index	FDI/GDP, trade openness, official development asistance/GDP, gross domestic savings/GDP, energing, governance	When foreign direct investment as percent of GDP increases one unit, life expectancy at birth (life expectancy index) increases 0.516 %.

Table 10. Studies for FDI-Health (Cont.)

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Cao et al. (2017)	Panel	2013-2015, 23 Asian countries.	Fixed Effect Model	Inequality in life expectancy, Inequality in education, Inequality in income	FDI	When FDI increases 1 %, adjusted life year decreases 0.0107 %.
Kamangaza (2009)	Panel	1990-2006, 103 developing countries	Regression Analysis	FDI	Remittances, regions, GNI,life expectancy, and school enrollments at primary, secondary, and tertiary levels.	When life expectancy increases 1 % , FDI decreases 2.5 % .
Steensma and Reiter (2010)	Panel	1980–2006, 49 developing countries	Panel linear regression with country fixed effects	Foreign direct investment inward flow	Improvement in life expectancy, Improvement in adult literacy, Foreign aid, control variables	An increase in FDI flow from the sample mean to standard deviation above the mean decreased year to year improvement in life expectancy by 2.54 %..

Table 10. Studies for FDI-Health (Cont.)

Study	Data Type	Period and Countries	Method	Dependent Variable	Independent Variables	Results for FDI-Health
Gökmenoğlu et al. (2018)	Time series	1972-2013, Nigeria	Toda-Yamamoto test, Johansen, DOLS	Gross national income pc, Life expectancy, School enrollment	FDI/GDP	A 1% increase in FDI inflows decreases the life expectancy 0.059 % (at the significance of 1 %) at birth, which is a proxy for public health.
Gövdeli (2019)	Panel	1992-2016, E7 countries	Cross sectional dependency tests	FDI, GDP, Trade openness	Life expectancy	There's one way causality from life expectancy to FDI.

APPENDIX 2: RESULTS FOR FMOLS WITH DUMMY

Dependent Variable: LNH
Method: Fully Modified Least Squares (FMOLS)
Date: 02/14/21 Time: 17:52
Sample (adjusted): 1976 2018
Included observations: 43 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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
C	3.287289	0.052650	62.43606	0.0000

R-squared	0.995613	Mean dependent var	4.211900
Adjusted R-squared	0.994882	S.D. dependent var	0.097478
S.E. of regression	0.006974	Sum squared resid	0.001751
Long-run variance	7.71E-06		

Figure 10. Results for FMOLS with Dummy

APPENDIX 3: RESULTS FOR FMOLS WITHOUT DUMMY

Dependent Variable: LNH
Method: Fully Modified Least Squares (FMOLS)
Date: 02/14/21 Time: 17:53
Sample (adjusted): 1976 2018
Included observations: 43 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNY	0.039548	0.019301	2.049008	0.0476
LNSCH	0.000432	0.009965	0.043394	0.9656
LNFDI	0.001298	0.002131	0.609348	0.5460
LNEXPN	0.060742	0.005291	11.48110	0.0000
LNTRA	0.054169	0.004811	11.25958	0.0000
C	3.320384	0.131444	25.26077	0.0000

R-squared	0.992728	Mean dependent var	4.211900
Adjusted R-squared	0.991745	S.D. dependent var	0.097478
S.E. of regression	0.008856	Sum squared resid	0.002902
Long-run variance	5.06E-05		

Figure 11. Results for FMOLS without Dummy

APPENDIX 4: PERIOD CHANGE

Dependent Variable: LNH
Method: Fully Modified Least Squares (FMOLS)
Date: 02/14/21 Time: 17:53
Sample (adjusted): 1976 2018
Included observations: 43 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

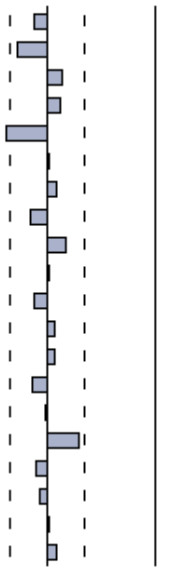
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNY	0.039548	0.019301	2.049008	0.0476
LNSCH	0.000432	0.009965	0.043394	0.9656
LNFDI	0.001298	0.002131	0.609348	0.5460
LNEXPN	0.060742	0.005291	11.48110	0.0000
LNTRA	0.054169	0.004811	11.25958	0.0000
C	3.320384	0.131444	25.26077	0.0000

R-squared	0.992728	Mean dependent var	4.211900
Adjusted R-squared	0.991745	S.D. dependent var	0.097478
S.E. of regression	0.008856	Sum squared resid	0.002902
Long-run variance	5.06E-05		

Figure 12. Period Change

Correlogram of Residuals

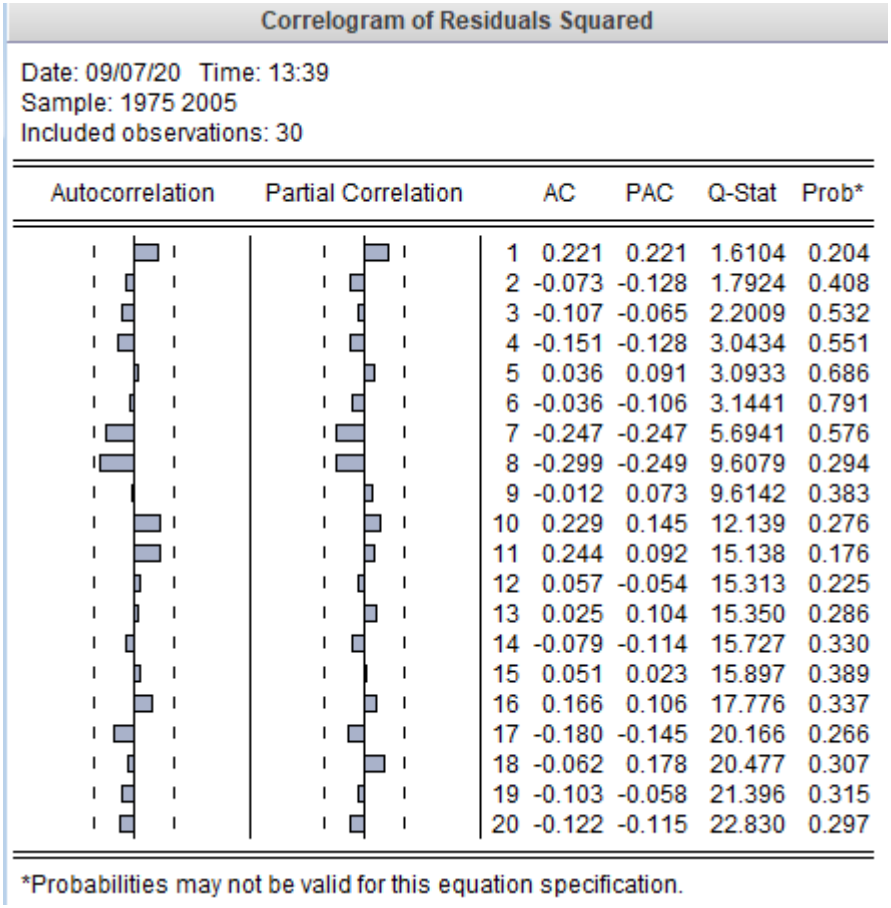
Date: 09/07/20 Time: 13:37
Sample: 1975 2005
Included observations: 30



		AC	PAC	Q-Stat	Prob*
1		-0.136	-0.136	0.6088	0.435
2		-0.282	-0.306	3.3273	0.189
3		0.134	0.047	3.9615	0.266
4		0.116	0.068	4.4541	0.348
5		-0.389	-0.348	10.267	0.068
6		0.008	-0.073	10.270	0.114
7		0.096	-0.138	10.656	0.154
8		-0.167	-0.205	11.879	0.157
9		0.173	0.213	13.247	0.152
10		0.015	-0.201	13.258	0.210
11		-0.139	-0.119	14.234	0.220
12		0.072	0.027	14.508	0.269
13		0.077	-0.200	14.843	0.317
14		-0.153	0.020	16.253	0.298
15		-0.009	-0.098	16.259	0.365
16		0.309	0.173	22.793	0.119
17		-0.102	0.068	23.555	0.132
18		-0.071	-0.054	23.960	0.156
19		0.014	-0.047	23.977	0.197
20		0.087	0.067	24.696	0.213

*Probabilities may not be valid for this equation specification.

Figure 13. Correlogram of Residuals (Period Change FMOLS Results)



Correlogram of Residuals Squared

Date: 09/07/20 Time: 13:39
Sample: 1975 2005
Included observations: 30

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.221	0.221	1.6104	0.204
		2	-0.073	-0.128	1.7924	0.408
		3	-0.107	-0.065	2.2009	0.532
		4	-0.151	-0.128	3.0434	0.551
		5	0.036	0.091	3.0933	0.686
		6	-0.036	-0.106	3.1441	0.791
		7	-0.247	-0.247	5.6941	0.576
		8	-0.299	-0.249	9.6079	0.294
		9	-0.012	0.073	9.6142	0.383
		10	0.229	0.145	12.139	0.276
		11	0.244	0.092	15.138	0.176
		12	0.057	-0.054	15.313	0.225
		13	0.025	0.104	15.350	0.286
		14	-0.079	-0.114	15.727	0.330
		15	0.051	0.023	15.897	0.389
		16	0.166	0.106	17.776	0.337
		17	-0.180	-0.145	20.166	0.266
		18	-0.062	0.178	20.477	0.307
		19	-0.103	-0.058	21.396	0.315
		20	-0.122	-0.115	22.830	0.297

*Probabilities may not be valid for this equation specification.

Figure 14. Correlogram of Residuals Squared (Period Change FMOLS Results)

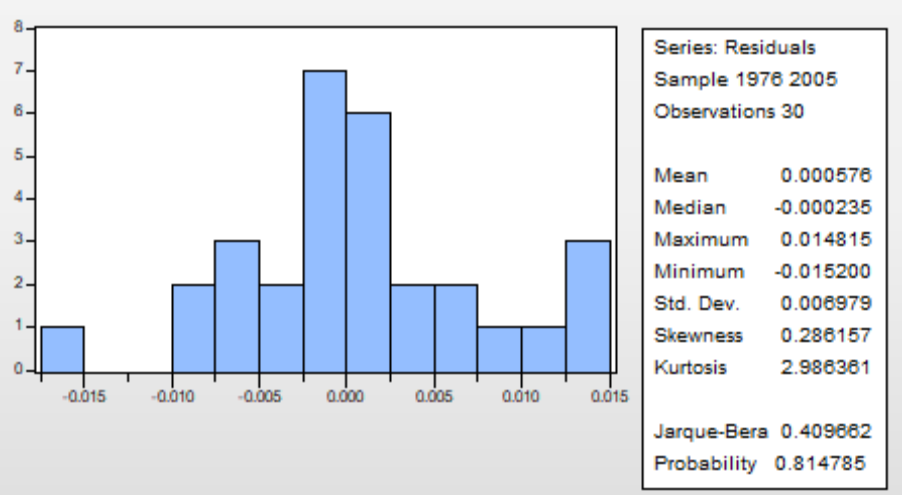


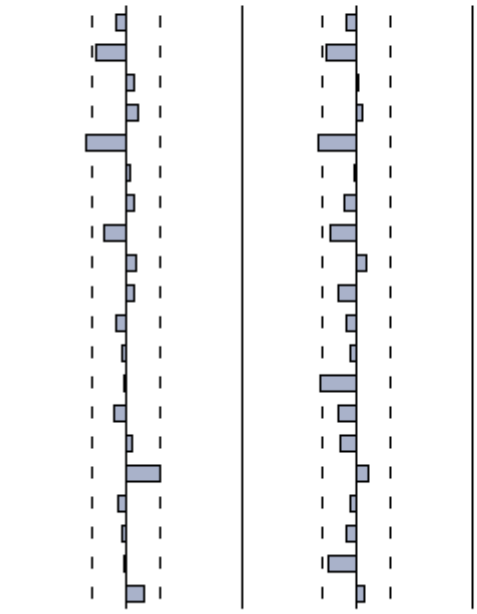
Figure 15. Histogram Result (Period Change FMOLS Results)

APPENDIX 5: CCR AND DOLS

CCR

Correlogram of Residuals

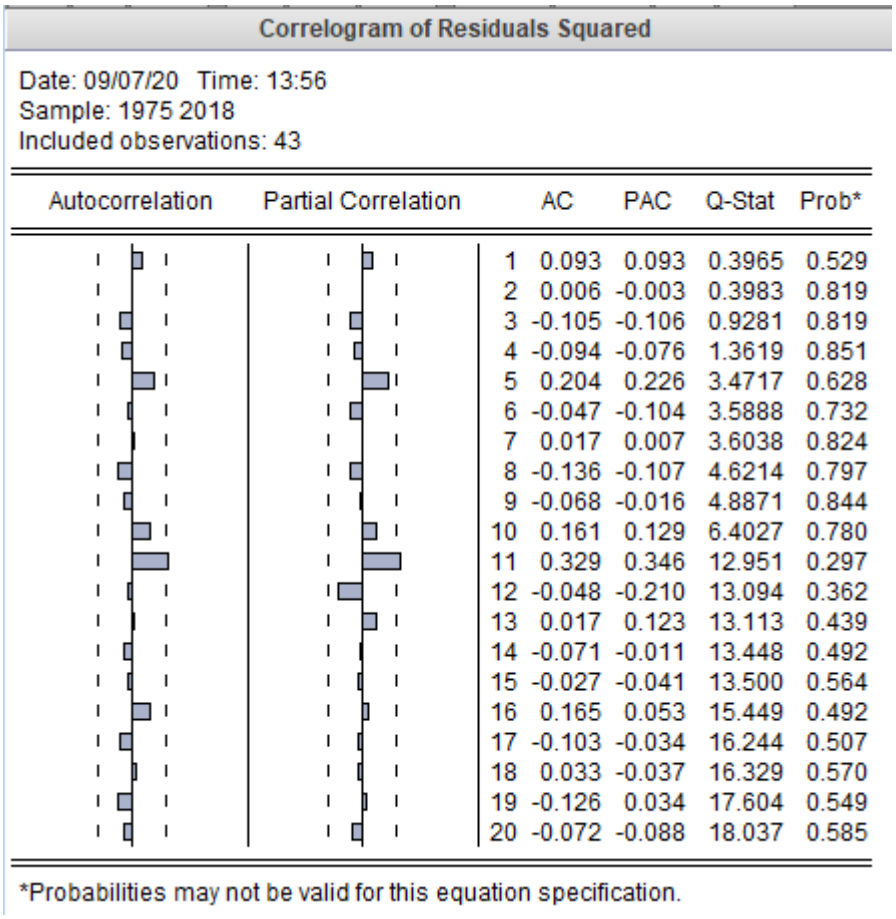
Date: 09/07/20 Time: 13:53
Sample: 1975 2018
Included observations: 43



	AC	PAC	Q-Stat	Prob*
1	-0.095	-0.095	0.4198	0.517
2	-0.266	-0.277	3.7494	0.153
3	0.079	0.022	4.0509	0.256
4	0.101	0.043	4.5614	0.335
5	-0.353	-0.339	10.917	0.053
6	0.029	-0.010	10.962	0.090
7	0.081	-0.112	11.315	0.125
8	-0.192	-0.230	13.347	0.100
9	0.083	0.095	13.743	0.132
10	0.075	-0.170	14.072	0.170
11	-0.097	-0.094	14.643	0.199
12	-0.038	-0.064	14.732	0.256
13	-0.020	-0.328	14.757	0.323
14	-0.107	-0.172	15.522	0.343
15	0.058	-0.148	15.754	0.399
16	0.304	0.111	22.393	0.131
17	-0.079	-0.050	22.856	0.154
18	-0.040	-0.090	22.980	0.191
19	-0.024	-0.252	23.025	0.236
20	0.156	0.069	25.076	0.199

*Probabilities may not be valid for this equation specification.

Figure 16. Correlogram of Residuals (CCR Results)



Correlogram of Residuals Squared

Date: 09/07/20 Time: 13:56
Sample: 1975 2018
Included observations: 43

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.093	0.093	0.3965	0.529
		2	0.006	-0.003	0.3983	0.819
		3	-0.105	-0.106	0.9281	0.819
		4	-0.094	-0.076	1.3619	0.851
		5	0.204	0.226	3.4717	0.628
		6	-0.047	-0.104	3.5888	0.732
		7	0.017	0.007	3.6038	0.824
		8	-0.136	-0.107	4.6214	0.797
		9	-0.068	-0.016	4.8871	0.844
		10	0.161	0.129	6.4027	0.780
		11	0.329	0.346	12.951	0.297
		12	-0.048	-0.210	13.094	0.362
		13	0.017	0.123	13.113	0.439
		14	-0.071	-0.011	13.448	0.492
		15	-0.027	-0.041	13.500	0.564
		16	0.165	0.053	15.449	0.492
		17	-0.103	-0.034	16.244	0.507
		18	0.033	-0.037	16.329	0.570
		19	-0.126	0.034	17.604	0.549
		20	-0.072	-0.088	18.037	0.585

*Probabilities may not be valid for this equation specification.

Figure 17. Correlogram of Residuals Squared (CCR Results)

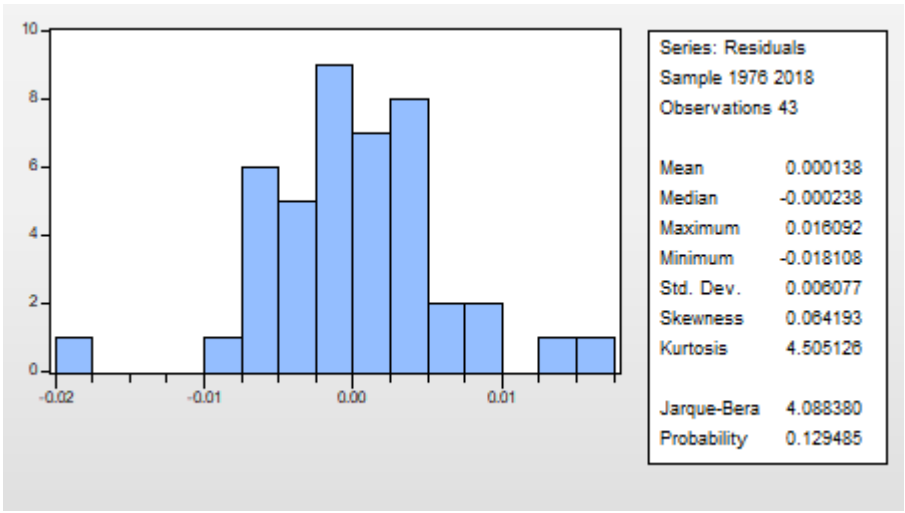
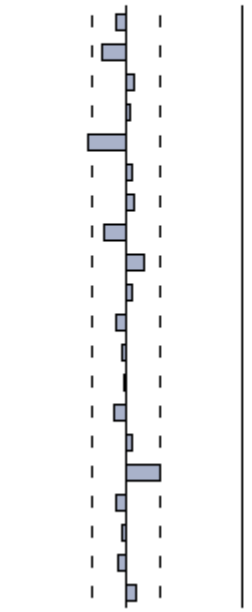


Figure 18. Histogram Result (CCR Result

DOLS

Correlogram of Residuals

Date: 09/07/20 Time: 13:58
Sample: 1975 2018
Included observations: 44



	AC	PAC	Q-Stat	Prob*
1	-0.091	-0.091	0.3886	0.533
2	-0.223	-0.233	2.7835	0.249
3	0.066	0.022	3.0009	0.391
4	0.038	-0.005	3.0728	0.546
5	-0.338	-0.336	9.0165	0.108
6	0.062	-0.002	9.2242	0.161
7	0.072	-0.081	9.5105	0.218
8	-0.195	-0.213	11.642	0.168
9	0.169	0.163	13.301	0.149
10	0.058	-0.139	13.504	0.197
11	-0.088	-0.020	13.976	0.234
12	-0.036	-0.044	14.059	0.297
13	-0.009	-0.235	14.064	0.369
14	-0.114	-0.035	14.942	0.382
15	0.060	-0.045	15.197	0.437
16	0.298	0.241	21.614	0.156
17	-0.097	0.000	22.324	0.173
18	-0.043	-0.054	22.467	0.212
19	-0.075	-0.172	22.917	0.241
20	0.083	0.061	23.494	0.265

*Probabilities may not be valid for this equation specification.

Figure 19. Histogram Result (CCR Results)

Correlogram of Residuals Squared

Date: 09/07/20 Time: 13:58
Sample: 1975 2018
Included observations: 44

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.152	0.152	1.0813	0.298
		2	0.002	-0.021	1.0815	0.582
		3	-0.112	-0.112	1.7048	0.636
		4	-0.114	-0.083	2.3606	0.670
		5	0.127	0.163	3.1999	0.669
		6	-0.045	-0.106	3.3080	0.769
		7	0.013	0.013	3.3175	0.854
		8	-0.115	-0.105	4.0590	0.852
		9	-0.081	-0.029	4.4341	0.881
		10	0.221	0.224	7.3363	0.693
		11	0.326	0.295	13.865	0.241
		12	-0.046	-0.235	13.999	0.301
		13	0.011	0.120	14.007	0.373
		14	-0.071	0.033	14.345	0.424
		15	-0.039	-0.079	14.450	0.492
		16	0.130	0.103	15.664	0.477
		17	-0.090	-0.079	16.273	0.505
		18	0.060	0.030	16.552	0.554
		19	-0.139	-0.007	18.123	0.514
		20	-0.083	-0.109	18.705	0.541

*Probabilities may not be valid for this equation specification.

Figure 20. Table for Correlogram of Residuals Squared (DOLS Results)

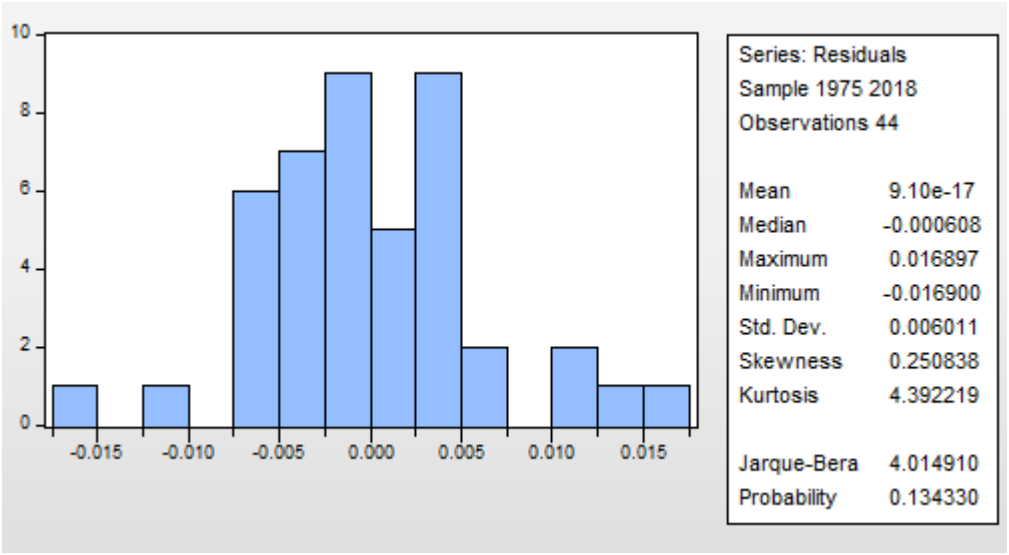


Figure 21. Histogram Result (DOLS Results)

APPENDIX 6: GRAPHS FOR LOG FORMS OF VARIABLES

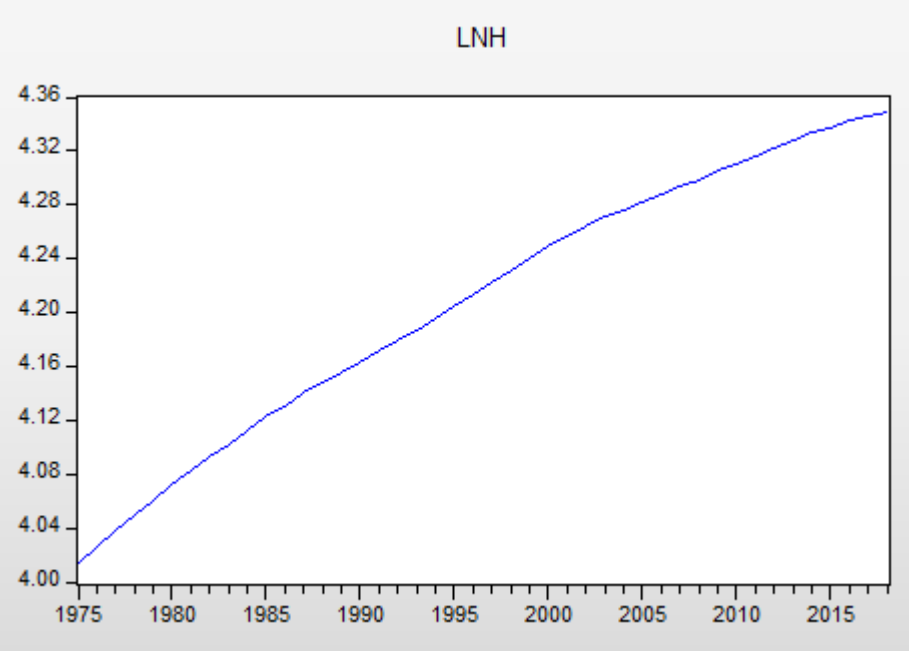


Figure 22. Graph for Life Expectancy

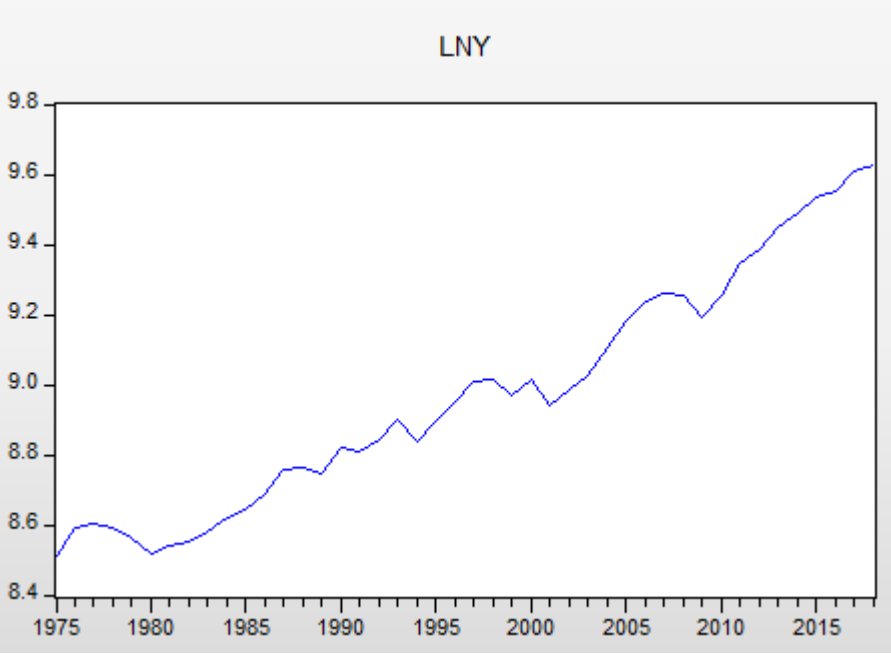


Figure 23. Graph for Real GDP per capita

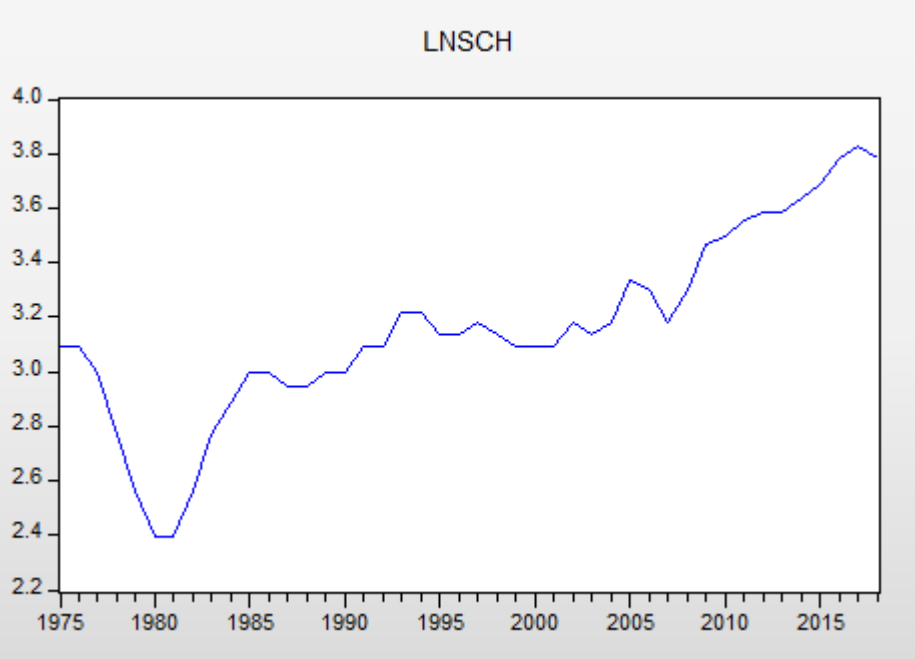


Figure 24. Graph for Number of Students per Teacher in Tertiary Education

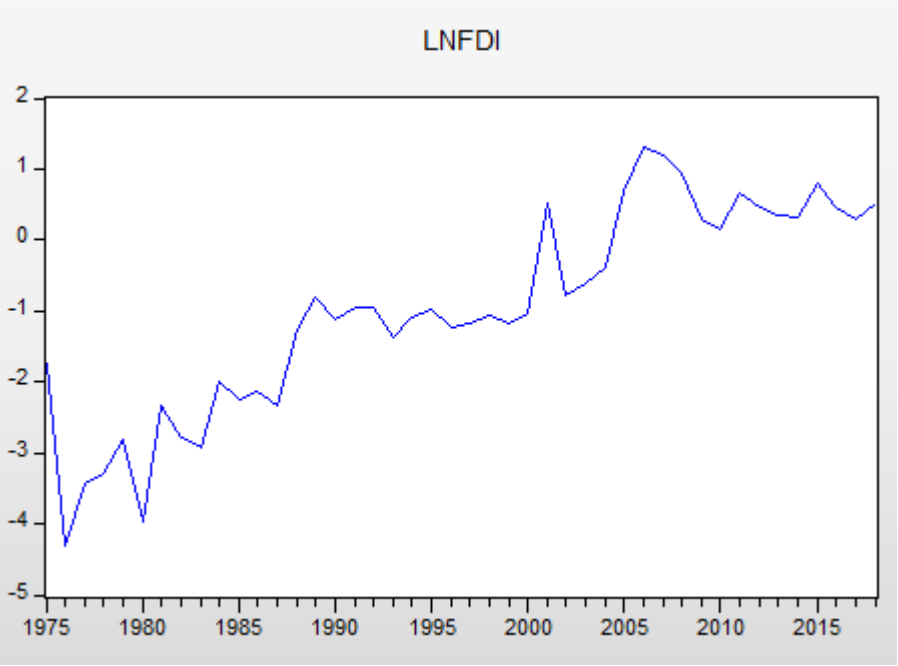


Figure 25. Graph for Foreign Direct Investment

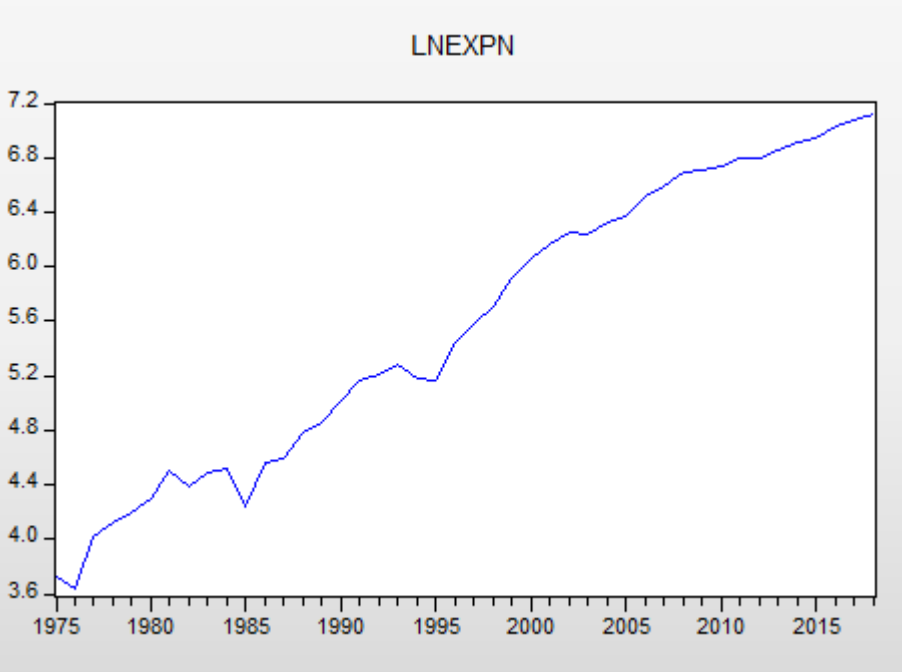


Figure 26. Graph for health expenditures per capita

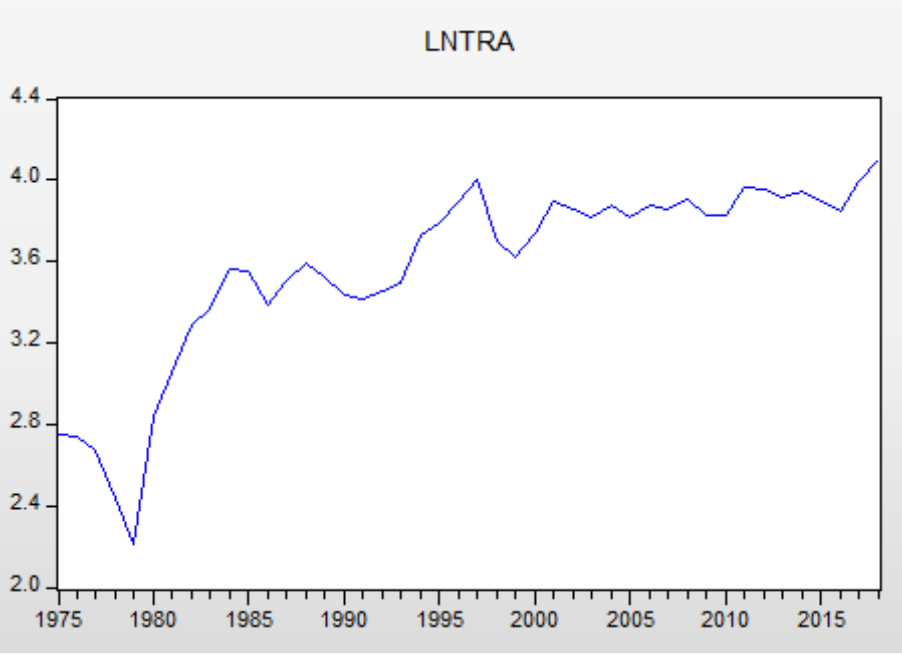


Figure 27. Trade Openness