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EFFECT OF HEALTH EXPENDITURE ON ECONOMIC GROWTH IN TURKEY

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TÜRKİYE'DE SAĞLIK HARCAMALARININ EKONOMİK BÜYÜME ÜZERİNDE ETKİSİ

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ABSTRACT

EFFECT OF HEALTH EXPENDITURE ON ECONOMIC GROWTH IN TURKEY

ELİF COŞKUN

It is a well-known fact that human capital development is one of the main inputs to economic growth. Human capital comprises concepts such as knowledge, skills, abilities, health status, and education. In this context, the concept can not be solely associated with education and training. It is also associated with any activity that increases the future income level by increasing the workforce's productivity and quality. Health is seen as an indispensable element of human capital and economic activity. Therefore, this study aims to examine the relationship between health expenditures and economic growth, after the health transformation program (2003). In particular, The research is conducted in Turkey's case to study the impact of the health transformation program (2003) in Turkey. Besides, a dummy variable is added to the model to examine the impact of the health transformation program(2003). In order to reach its aim, this study uses the data of Turkey between 1975 and 2019. Phillips Perron unit root test is used to analyze the stationarity of variables. Then Johansen cointegration test is conducted in order to identify the relationship between variables. The study also uses the Error Correction Model (ECM) to identify the long-run as well as the short-run relationships among the considered variables. Accordingly, it has been determined that the health transformation program (2003) has a positive relationship in the long run. Moreover, it is found that the other independent variables also have a positive relationship.

Key Words: Economic Growth, Health Expenditure, Johansen Cointegration Test, Error Correction Model.

ÖZ

SAĞLIK HARCAMALARININ EKONOMİK BÜYÜME ÜZERİNDEKİ ETKİSİ: TÜRKİYE ÖRNEĞİ

ELİF COŞKUN

Beşeri sermaye gelişiminin ekonomik büyümenin ana girdilerinden biri olduğu bilinen bir gerçektir. Beşeri sermaye bilgi, beceriler, yetenekler, sağlık durumu ve eğitim gibi kavramlardan oluşur. Bu bağlamda, kavram sadece eğitim ve öğretim ile ilişkilendirilemez. Aynı zamanda işgücünün üretkenliğini ve kalitesini artırarak gelecekteki gelir düzeyini artıran herhangi bir faaliyetle de ilişkilendirilir. Sağlık, beşeri sermaye ve ekonomik faaliyetin vazgeçilmez bir unsuru olarak görülmektedir. Bu nedenle bu çalışma, sağlıkta dönüşüm programı (2003) sonrasında sağlık harcamaları ile ekonomik büyüme arasındaki ilişkiyi incelemeyi amaçlamaktadır. Araştırma, özellikle Türkiye örneğinde, sağlıkta dönüşüm programının (2003) Türkiye'deki etkisini incelemek için yapılmıştır. Ayrıca, sağlıkta dönüşüm programının (2003) etkisini incelemek için modele bir kukla değişken eklenmiştir. Bu çalışmada, 1975-2019 Türkiye verileri kullanılmıştır. Değişkenlerin durağanlığını analiz etmek için Phillips Perron birim kök testi kullanılmıştır. Ardından değişkenler arasındaki ilişkiyi belirlemek için Johansen eşbütünleşme testi yapılmıştır. Çalışma ayrıca, dikkate alınan değişkenler arasındaki uzun vadeli ve kısa vadeli ilişkileri belirlemek için Hata Düzeltme Modelini (ECM) kullanmıştır. Buna göre sağlıkta dönüşüm programının (2003) uzun vadede ekonomik büyüme ile arasında pozitif bir ilişki olduğu tespit edilmiştir. Üstelik diğer bağımsız değişkenler ile ekonomik büyüme arasında da pozitif ilişki olduğu bulunmuştur.

Anahtar Kelimeler: Ekonomik Büyüme, Sağlık Harcamaları, Johansen Eşbütünleşme Testi, Hata Düzeltme Modeli

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ABBREVIATIONS

ASEAN : Association of Southeast Asian Nations

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

ECO : Economic Cooperation Organization

GDP : Gross Domestic Product

GMM : Generalized Method of Moments

IMF : International Monetary Fund

OECD : Organisation for Economic Co-operation and Development

PP : Phillips-Perron Unit Root Test

ECM : Error Correction Model

INTRODUCTION

It is a well-known fact that people's survival depends on healthy generations' growth and economic efficiency. Therefore, health is seen as one of the most significant notions and indispensable human beings' values. Healthy people can learn better, improve their skills, and increase their well-being with higher income by increasing their productivity. But, while doing all this requires being healthy, preserving and maintaining health, it also requires some expenditure on health care. According to the related literature, health expenditures contribute to economic growth by increasing the health level of both individual and the society as a whole (Bloom et al.2001; Sab and Smith 2001; Göz et al. 2008; Ashar et al.2012; Nyamwange. 2012; Majdi 2014; Aydemir and Baylan 2015; Badri and Badri 2016).

On the other hand, economic growth, which is generally identified as the increase in the number of goods and services produced in a country, constitutes one of the issues that all countries are closely interested in. The studies for sustainable economic growth and the Solow Model's important shortcomings have led to the emergence of new approaches that explain how growth occurs and the policies that affect growth. Towards the end of the 1980s, new theories that started with Romer (1986) continued with the studies of Lucas (1988) and Barro (1990), which are focused on finding the "missing element of growth." These theories, known as endogenous (new) growth theories, suggest that there may be an increased return on capital, including human capital, and that this increased return will not reduce growth in the long run (Tıraş, 2018).

The concept of human capital comprises all of the concepts such as knowledge, skills, abilities, health status, and education. Therefore, the concept can not be solely associated with education and training. It is also associated with any activity that increases the future income level by increasing the workforce's productivity and quality (Woodhall, 1987: 21). Although the main source of human capital is education, society's health level is another factor that feeds human capital and indirectly contributes to economic development. As a matter of fact, health refers not only to the absence of disease and disability but also to individuals' capacity to develop their own potential throughout their life (Lusting, 2006: 1).

While health expenditures broadly cover all expenditures for the protection and development of health. Health expenditures save on health expenses that will arise in the future by preserving the working power and reducing the possible future health problems. In this context, spending on healthcare services is seen as an investment in human capital. Moreover, according to Akar (2014: 311), physical investments in the health sector (such as machinery and equipment) support technological development, technological advances encourage growth, and growth results in an additional rise in health expenditures again.

When we look at the economic growth data in Turkey from 1975 to 2019, because of the global oil crisis (1973) and the political difficulties in Turkey (the 1980 military coup) in 1980, the 1994 economic crisis, the 1999 earthquake, the 2001 economic crisis, and the 2008 global crisis, economic growth in Turkey has decreased markedly over these years. It has also struggled to achieve stable growth, and short-term growth periods have ended with contractions. And from the end of the '80s to the beginning of the 2000s, Turkey's economic development has been unstable and fragile. Economic development has been accomplished through structural reforms since 2002. Despite the fact that the country's economy, which contracted after the 2009 global financial crisis, achieved high growth in 2010-11, economic growth has lost considerable momentum in the last five years. However, we can observe that the real GDP of the country increases from 1975 to 2019. Similarly, when we examine Turkey's health spending, it increases in that period. Although health expenditure per capita in Turkey is far behind the OECD countries, health expenditure in Turkey is rising, just as health spending in the world is growing over time. It is seen that high-income countries such as the USA, Switzerland, Norway allocate a higher share of GDP to health spending, and health spending per capita is higher. Today, when Turkey is compared to other OECD countries since Turkey allocates 4,38 percent of GDP for health spending, it is one of the OECD countries which are allocating to the lowest level of share. The United States has attracted attention as the country that allocates the most share from the budget for health in recent years. In 2019, total spending on healthcare in the USA accounted for 17 percent of GDP. The USA was followed by Switzerland with 12.1 percent, Germany with 11.7 percent, and France with 11.2 percent. Globally, health care expenditure has risen dramatically since 1980. In 2019, the OECD average share of health spending in GDP was 8.8%, which is almost twice that of Turkey (4,38).

However, health spending has grown faster than economic growth since the late 1990s and early 2000s, although it slowed down in the recession of 2009(Stebbins, 2015). While health expenditure per capita was 41.8 dollars in 1975, it increased to 1337.2 in 2019 and grew approximately 32 times. When we look at the GDP value, it was 1,136.375 dollars per capita in 1975, and it increased by eight times in 2019 and reached 9,121.561 dollars. Although the share of health expenditures in GDP has increased in the time period, as stated before, this ratio remained behind the average of many developed countries and the OECD average. The share of the health expenditures in GDP is 2.16 in 1975, and it reached the peak level in 2009; the value of health expenditures in GDP is 5.53. However, since 2009, it has decreased continuously and reached 4.38 in 2019. In Turkey, health spending is increasing over time, just as GDP is rising.

The government is responsible for a substantial portion of the overall health spending budget of Turkey. Looking at the last 20 years, in 1999, the proportion of public health spending in overall health expenditure is 61.1, whereas private health expenditure is 38.9. In 2019, the share of public health spending in overall health expenditure was 78 percent, while the share of private health expenditure declined to 22 percent. Looking at these rates, it can be argued that the public sector is dominant in the health sector. The inpatient medical institutions consist of hospitals affiliated with the Ministry of Health, university hospitals, and private hospitals. Hospitals affiliated with the ministry of health have the largest proportion of inpatient health institutions. Private hospitals have the lowest proportion. On the other hand, the number of inpatient medical institutions and the number of hospital beds has increased over the years in Turkey.

The number of health professionals, the number of equipment used in health care, the health services utilization rate in Turkey have increased gradually and results in increased health status. It is a fact that from the foundation of the Republic of Turkey to today, the number of health professionals number increased steadily. In 1928, while the number of the physician was 1 078, it reached 160 810 in 2019, and it increased almost 160 times at that time intervals. Likewise, there has been a significant increase in the number of nurses, midwives, and dentists. In 1928, the number of nurses was 130, and the number of midwives was 377. In 2019, this number reached 198 103 for nurses

and 55 972 for midwives. The number of patient beds, which are considered as one of the healthcare equipment, has increased like other equipment such as computed tomography (CT), magnetic resonance imaging units (MRI). While the number of hospital beds per 1000 people was 1,81, it reached 2.88 in 2019. The rate of use of health services in Turkey is observed that increased over the years. While physician consultation rates, hospital discharge rates, and child vaccination rates gradually increased, the length of stay in the hospital decreased. The decrease in the length of stay in the hospital means that the efficiency is increased and the costs are decreased. Some indicators such as life expectancy at birth, infant mortality rates, mortality, and morbidity rates use to measure the health level of countries. In Turkey, life expectancy has increased, and infant mortality rates have reduced. While In 1960, the infant mortality rate per 1000 live births was 171,5, it decreased dramatically to 8.6. Life expectancy at birth was determined as 45 years in 1960. By 2019, life expectancy at birth increased to 78 years.

As one of the basic elements of economic growth and development human capital efficiency is becoming more and more important. Health expenditures should be increased in order to ensure the development and efficiency of human capital. Increasing health expenditures also leads to economic growth and development in countries. Therefore, the relationship between health expenditures and GDP has an important place in the literature. It is seen in the studies conducted in the literature that education and health, which are the important components of human capital, significantly affect economic growth. Empirical findings obtained from the literature reveal that health and education developments increase productivity and production, which impacts economic growth. Health is an important factor in increasing the productivity of human capital, and as a result of understanding the importance of human capital in economic growth and development, in recent years, health spending has been increasing all over the world and in Turkey. There are many studies in the literature on the increase of health expenditures; The reasons for the increase in health expenditures and the effect of the increase in health expenditures on economic growth were examined. This study, it was aimed to examine the effect of the 2003 health transformation program in particular. Especially with the 2003 health transformation program, which is health policies were changed, caused an increase in health

expenditures. For this reason, it is aimed to examine the effect of the health transformation program in particular.

This study aims to analyze the relationship between health expenditures and economic growth in Turkey over the period between 1975 and 2019. Economic growth data, which is represented by GDP per capita, as well as the ratio of capital stock to GDP, the share of employment to the population, and the ratio of health expenditure to GDP, are obtained from the 10.0 Pennworld database. In order to analyze the stationarity of variables, the PP Unit Root Test is used. Then the Johansen cointegration test is conducted to identify the relationship between variables. As a result of Phillips perron unit root analysis, all variables are determined to be stationary to the same degree. Since all variables are stationary at the first-degree, cointegration analysis is deemed appropriate to examine the relationship between all variables. After searching for stationarity between series, Whether there is a long-term relationship or not is analyzed by the cointegration test. It was determined with the Johansen Cointegration test that the series are cointegrated; That is, there is a long-term relationship between the series.

This study consist of three chapters. After the introduction, detailed information related to health expenditure and economic growth and in the existing literature is given in chapter one. Health expenditures and health status-related data and graphs in Turkey are summarized in section two. The methodology and the analysis techniques are explained in chapter 3. And finally, the conclusion section has summarized the findings and the contributions of the study.

CHAPTER ONE

CONCEPTUAL FRAMEWORK

1.1. Economic Growth

Economic growth is basically defined as the increase in the amount of goods and services produced in a country over time. It is also seen as the only way to continuously increase the living standards of the people living in the country (Ünsal, 2013: 14). In other words, economic growth is defined as the continuous and significant increase in real income per capita based on the increase in production capacity (Karataş and Çankaya, 2010: 32). Hence, economic growth is seen as a long-term phenomenon, since these increases can only occur in the long term through the expansion or more efficient use of the country's production scale or potential (Kibritçioğlu, 1998: 208).

1.2. Economic Growth Models

Economic growth has been analyzed by developing many models and theories from classical economists' growth theories to growth models that are still valid today. The revealing of the main determinants behind the growth process is also the basis of these studies. Numerous attempts have been made to determine the impact of different factors on economic growth. Therefore, it is possible to examine the literature on the broad theory of growth by dividing it into four groups given in detail below (Evenson, 1997: 3).

1.2.1. Classical Growth Model

Examination of the mechanism of economic growth was a key characteristic of the work of the English classical economists, represented primarily by Adam Smith, Thomas Malthus, and David Ricardo. Given the speculations of those before them, they must be seen as the key precursors of current growth theory. The theories of this school have achieved their highest degree of advancement in Ricardo's work (Harris, 2007).

Classical economists analyze economic growth problems by applying general economic principles, seeing the economic system as a whole rather than a separate economic growth theory. According to the classical theory, it is emphasized that the

economy's functioning should be realized within its own rules, and there should be no interference in the market. Here, economic growth is evaluated based on capital accumulation, mechanization, and division of labor. And it is associated with technological development that provides increased production (Özel, 2012: 64). The source of growth is savings, investments, and capital accumulation. In perfect competition conditions, capital is utilized more efficiently, thus reducing costs and increasing profitability. Therefore, economic growth will decrease costs and increase profitability by naturally increasing capital accumulation and investments.

In his popular book "An Inquiry into the Nature and Causes of the Wealth of Nations," Adam Smith wrote about his theories on capital accumulation, labor productivity, labor division, and population growth. He supported trade liberalization but opposed the command economy. According to Smith, both agriculture and manufacturing sectors are productive, but government spending is inefficient. Another factor for economic growth is increasing the physical capital investment required for the working population. According to Smith, increasing physical capital allows the market to expand, and with more physical capital and employees, we get more output. This will increase the demand for more workers, increase employee wages and consequently increase the population. The idea of the "invisible hand" was one of the greatest contributors to the Wealth of Nations. According to this idea, capitalists were willing to invest in more physical capital to make more profits. He assumed that the capitalists, by accumulating capital, had added to the country's economic prosperity while earning profits. This would ensure the specialization and division of labor that are drivers of economic growth. The benefit provided by the division of labor in production can be expressed as follows; First of all, it allows an increase in the skill of people, the prevention of time loss caused by the transition from one work to another, and finally, the invention of machines that facilitate and reduce labor. Smith argued that liberalization of international trade and access to larger markets is important as it will reduce labor costs and increase productivity.

Smith put forward a supply-side growth model:

$$Y = f(N, K, L) \tag{1.1}$$

Where Y is output, N is labor, K is capital, L is land, so production is tied to labor and capital, and land inputs. As a result, output growth (G_Y) was motivated by population growth(G_N) , investment growth (G_I) and land growth(G_L), and increased total growth productivity (G_T).

$$G_Y = \phi\,(G_T, G_I, G_N, G_L) \qquad (1.2)$$

Smith's growth model remained an important model of Classical Growth. Later, David Ricardo (1817) changed the model by including diminishing returns to land. The amount of input must increase to ensure product growth. However, the land varies in quality, and the land supply is also stable. So, it is not possible to create new cultivation areas. This has two effects on growth: first, that due to the limited supply of land, the rents of the landowners increase over time and consequently reduce the profits of capitalists; Secondly, the price of goods obtained from agriculture will increase over time, and this will again reduce profits as workers require higher wages. But Ricardo argued that this situation could be well controlled by technological advances in machinery and specialization brought by trade.

However, Ricardo changed his view of the machine later. In reality, he argued, machine displaced labor. In this case, unemployment increases, and the amount of unused labor in the market increases. The amount of capital depends on increasing profits and savings rates. Unless the capital ratio increases, worker employment will not increase. In this case, workers cause lower labor income as there will be downward pressure on wages. For this extra labor to be re-employed without this effect, capital accumulation rate must be raised.

In addition, according to Malthus, while the population increases, the production of foodstuffs also increases. However, if population growth cannot be controlled, the population continues to grow geometrically; Food items will increase arithmetically. Thus, the difference between population and food items will become larger (Savaş,2000:342). Malthus's model has two basic elements: First, the supply of the land, which is one of the factors of production, is fixed and exhibits diminishing returns to scale. The second is that the standard of living has a positive effect on the population growth rate. The Malthusian model states that in the absence of technological changes or suitable soil, the population will self-balance and have negative feedback. That is,

while the population increases, the land/population ratio, and wages decrease. When technology is static, the population balances itself. On the other hand, even if the available resources increase, the per capita income level will not change. (Deliktaş, 2001: 94).

Malthus built his growth model on the mismatch between population and output growth rates. According to Malthus, real output (*Y*) in an economy is produced using land and labor. Since the amount of land is fixed, the real output varies depending on the labor force and, therefore, the population. Y = f (N) According to Malthus, production is subject to average yields decreasing according to the input of labor (Dulupçu and Özkul, 2012).

The classical model's basic assumptions are decreasing efficiency, low rate of technological progress, and Malthus' population rule. However, it is unlikely that the classics' growth model will find application in today's developed economies. The development experiences of economies after the industrial revolution are not parallel to the views of the classics. Although a very detailed analysis and a comprehensive critique of the classical model will not be included in this section, it can be proved with a few simple examples that the classical model cannot explain today's economies. For example, the rate of technological progress predicted by Ricardo is very slow compared to today's economies, and although the human population has shown a great increase in the 20th century, the high growth performances of economies simultaneously with the global process do not support Malthus's ideas (Halıcı Tülüce, 2013).

The contributions of classical economists have been discussed and analyzed by many economists later. However, economists highly criticized the model after the World Depression of 1929 (Kar and Taban, 2003: 146). Then, the economic doctrine in the form of the necessity of the government intervention in the economy came to the agenda and, the use of monetary and fiscal policies under the leadership of Keynes came to the fore (Özel, 2012: 64). Since then, economists agree that the states have been more involved in the economic life in developed and developing countries, and their regulatory role for the private sector has been gradually increasing (Landau, 1986: 35). The theoretical work on intervention in the economy, which started with Keynes, continued with Harrod and Domar's contributions.

1.2.2. Harrod and Domar Growth Model

Keynesian economics, known as demand-side economics, was developed in order to eliminate the unemployment and demand inadequacy created by the Great Depression in 1929. It set out from the idea of stimulating demand and incorporating the state into the economy as a critique of the supply-side approaches of classical economic thought that diminish the state's role. Ensuring efficient use of resources in the demand-side economy, it is possible to define it as an economic thought that suggests that the state should take guiding decisions on "total demand" in order to achieve economic growth and development, to ensure a fair distribution of income and wealth, and to ensure economic stability. The theoretical foundations of demand-side economics were included in the work "The General Theory of Employment, Interest and Money," published by J. M. Keynes in 1936 (Aktan,2004).

After the World Economic Depression of 1929, Keynes led the use of monetary and fiscal policies to overcome economic stagnation and achieve economic growth (Özel, 2012: 64-65). Keynes's analysis of growth is a short-term static analysis in this sense (Günsoy, 2013: 85). In the long run, the first studies to expand the Keynesian basic macroeconomic model were discussed in the studies by Roy Harrod (1939) and Evsey Domar (1946). Unlike the Classical Growth Theories, the model is a demand-oriented growth theory (Özel, 2012: 65). It is argued that increasing the model's growth rate will occur by increasing the marginal yield of capital or saving rate. Also, because of the constant production assumption in the model, the balance is only constructed as a coincidence in a place called the blade back (Atamtürk, 2007: 90).

Keynes focused on what should be done to get out of the recession created by the Great Depression rather than giving a direct formula for economic growth. The driving factor in recovery from the recession is the expansion of demand. The increase in demand leads to greater income growth than itself. This increase in income is equal to the amount of demand multiplied by a coefficient called a multiplier. The coefficient is determined by the ratio $\Delta C / \Delta Y$, which is called consumption propensity. In the following years, the Keynesian growth model was tried to be created based on the ideas of Keynes. The most typical example of this is the Horrod Domar Growth model (Dinler,2000: 513).

According to the growth model, in order for an economy to grow while sustaining price stability, the capacity-stimulating effect of investments and their income-increasing impact must be equal; In order to grow while maintaining full employment, real growth and natural growth must be equal. However, since the marginal efficiency of capital, marginal propensity to save and consumption, population growth rate, and expectations will change over time, it is not possible to meet these conditions automatically under market conditions. Therefore, the state as a regulatory power is asked to intervene in the economy. Additionally, the labor is not included as an input in this model (Halıcı Tülüce, 2013).

The model can be formulated in its simplest form:

$$g = s/k \tag{1.3}$$

The capital stock is a function of real gross national product.

$$K_t = k\, Y_t \tag{1.4}$$

$$k = K_t/Y_t \tag{1.5}$$

K_t : Capital stock in period (t).

Y_t: The output (or real gross national product) in the period (t).

k: Capital / output ratio.

If we assume that a certain ratio of output is saved;

$$I_t = sY_t = K_{t+1} - K_t = dK_t \tag{1.6}$$

d: The depreciation rate of the capital stock.

I_t: Total investment in period (t).

The growth rate is denoted by g;

$$g = \frac{Y_{t+1}-Y_t}{Y_t} = \frac{\Delta Y_t}{Y_t} \tag{1.7}$$

Capital is increasing at the same rate.

$$\frac{\Delta Y_t}{Y_t} = \frac{\Delta K_t}{K_t} \quad (1.8)$$

The basic Harrod Domar growth model;

$$g = \frac{sY - dK}{K} = \frac{s}{k} - d \quad (1.9)$$

If the depreciation rate is neglected;

$$g = \frac{\Delta Y}{Y} = \frac{s}{k} \quad (1.10)$$

g: Growth rate, s: Saving rate, k: Capital / Output ratio.

According to the model, if the amount of investment equals saving, the economy will grow at a rate determined by the marginal propensity to save, as determined by the capital/output coefficient. Although it is based on fairly simple assumptions, the model reveals the dynamic growth process (Halıcı Tülüce, 2013).

According to the Harrod-Domar model, either saving rates or the efficiency of capital should be increased in order to achieve economic growth (Yülek, 1997: 4). Hence, economic growth will be continuous if the demand is equal to each stage's capacity and it operates a balanced growth mechanism. In cases where demand is fixed or smaller than capacity, an unbalanced growth process will emerge (Güvel, 2011: 48). Like earlier growth models, the Harrod-Domar model has also been criticized for its assumptions that could only explain developed countries' growth performance (Özel, 2012: 65). Especially in the 1950s, various studies were carried out to overcome the model's shortcomings.

1.2.3. Neoclassical Growth Model

The neoclassical growth theory (Shaw, 1992: 611), especially based on the pioneering work of Solow (1956) and Swan (1956), has developed in the following years with the contributions of many economists (See for instance: Denison 1961, Cass 1965, Koopmans 1965). Neoclassical Growth Theory, which basically has the problem of how population growth and technological change affect savings, investment, and economic growth, has gained a very important place in the growth literature with

Solow's study in 1956 to examine the growth experience of the American economy. Solow and Swan's model developed independently of each other was later called the Solow-Swan Model (Taban,2008: 67).

The neoclassical growth model, also known as the Solow model in the literature, has been developed to reveal the interaction between the growth of capital stock in the economy, the increase in the workforce, and technological development and how this affects the economic growth of a country (Taban, 2013: 109).

The Solow Growth model is based on the neoclassical production function constitute. According to the Neoclassical Growth Model, the inputs have decreasing yields, and the return to scale is constant. This production function is combined with the constant rate of savings assumption in order to establish a simplified general equilibrium model of the economy.

The basic Solow model consists of two equations, a production function and a capital accumulation equation. The production function explains how inputs are integrated to produce output. In order to simplify the model, it is divided these inputs into two groups, capital (*K*) and labor (*L)*, and represented output as *Y* (Jones and Vollrath, 2012:22).

$$Y = F(K, L) = K^{\alpha} L^{1-\alpha} \tag{1.11}$$

where α is some number that lies between 0 and 1. This production function reprsents constant returns to scale: in the case that all inputs are doubled, the output will be exactly doubled.

In an economy, firms pay workers wages (*w*) in exchange for their labor. They rent (*r*) for the capital used in production. Firms employ labor until the marginal product of labor is equal to the wage and rent capital until the marginal product of capital is equal to the rental price.

$$w = \frac{\partial F}{\partial L} = (1 - \alpha)\frac{Y}{L},$$

$$r = \frac{\partial F}{\partial K} = \alpha \frac{Y}{K}.$$

$$Y = wL + rK \tag{1.12}$$

That is, payments to the inputs completely exhaust the value of output produced so that there are no economic profits to be earned. The conclusion is a general property of production functions with constant returns to scale.

$y = \frac{Y}{L}$ (output per worker)

$k = \frac{K}{L}$ (capital per worker)

$$y = k^{\alpha} \tag{1.13}$$

This is a production function. The more capital, the more output firms produce. But, there are diminishing returns to capital per worker. In other words, with each additional unit of the capital, the worker produces less and less output.

The second significant equation of the Solow model is the capital accumulation equation. It is presented in the below:

$$\dot{K} = sY - \delta K \tag{1.14}$$

Here, $\dot{K}$ is the change in the capital stock. sY the amount of gross investment. δK is the amount of depreciation that occurs during the production process.

$$\dot{K} = \frac{dK}{dt} \tag{1.15}$$

It is used the "dot" notation to express a derivative with respect to time.

$$k = \frac{K}{L} \tag{1.16}$$

$$\frac{k}{\dot{k}} = \frac{K}{\dot{K}} - \frac{L}{\dot{L}} \tag{1.17}$$

To study evaluation of output per person in the economy, capital accumulation is rewritten in terms of capital per person.

$$y = k^{\alpha} \tag{1.18}$$

A crucial presumption is that the labor force participation rate is constant and that the parameter n gives the population growth rate.

The equation can be obtained as follow:

$$\frac{\dot{K}}{k} = \frac{sY}{K} - n - \delta \quad (1.19)$$

The capital accumaltion equation in per worker terms:

$$\dot{k} = sy - (n + \delta)k. \quad (1.20)$$

Investment per worker (*sy*) increases "*k*". But, depreciation per worker (δk) reduces "*k*". The term nk in this equation decreases in "*k*" due to population growth. Even without new investment and depreciation, capital per worker would decrease due to the increase in the labor force (*nL*).

When the technology which is indicated with *A* has added to the model in order to generate sustained growth in per capita income, the new equation formed is as follows:

$$Y = F(K, AL) = K^{\alpha}(AL)^{1-\alpha} \quad (1.21)$$

A significant presumption of the Solow model is that technological progress is exogenous. After adding technology to the Solow model, the capital accumulation equation is the same as the previous equation. That is, "*A*" is growing at a constant rate.

$$\frac{\dot{K}}{K} = s\,\frac{Y}{K} - \delta \quad (1.22)$$

If we rewrite the technology-added version of the model for the production function:

$$y = k^{\alpha} A^{1-\alpha} \quad (1.23)$$

After taking the logarithm and differentiate:

$$\frac{\dot{y}}{y} = \alpha\,\frac{\dot{k}}{k} + (1-\alpha)\frac{\dot{A}}{A} \quad (1.24)$$

If *Y* >*K* is constant, the growth rate of *K* will be constant. Moreover, *y*>*k* is also constant; *y* and *k* will be growing at the same rate. *A* state where capital, output, consumption, and population growth at constant rates is called a balanced growth path. Output per worker and capital per worker growth at the rate of exogenous technological

change, g. If there is no technological progress, so there is no long-run growth in output per worker or capital per worker; $gy = gk = g = 0$. The model with technology exposes that technological progress is the source of sustained per capita growth.

Rewriting the production function in terms of $\hat{y}$:

$$\hat{y} = \hat{k}^{\alpha} \tag{1.25}$$

The variable $\hat{k}$ is the ratio of capital per worker to technology. The variable $\hat{y}$ is the ratio of output to technology.

$$\frac{\hat{k}\cdot}{\hat{k}} = \frac{\dot{K}}{K} - \frac{\dot{A}}{A} - \frac{\dot{L}}{L} \tag{1.26}$$

After combining this equation with the capital accumulation equation, the equation which in below is obtained:

$$\hat{k}\cdot = s\hat{y} - (n + g + \delta)\hat{k} \tag{1.27}$$

The diagram in which the technology is added and the one without the technology are very similar to each other, but the interpretation of the diagram is different. $(n + g + \delta)\ \hat{k}$ denotes breakeven investment per effective labor. The main purpose of breakeven investment is to keep the effective stock of capital per labor at the current level. The main purpose of the break-even investment equation is to show economic growth. Because if $s\hat{y} > (n + g + \delta)\ \hat{k}$, capital stock and output level per effective labor increase, that is, growth occurs. If $s\hat{y} < (n + g + \delta)\ \hat{k}$, there is negative growth. The important point here is that $(n + g + \delta)\ k$ increases at a constant rate due to investments of $n, g, \delta,$ which are considered constant, while sy increases by decreasing in accordance with the law of diminishing returns to scale. Thus, it automatically reaches a steady-state. $sy = (n + g + \delta)\ k$ equation expresses the steady state. With the steady-state occurring, international capital is shifting to poor countries where it can be used more effectively. According to the model, as a result of the displacement of capital, in the long run, the income levels of the countries approach each other, and the poor countries catch up with the developed countries. Equalization in income levels is called the "Convergence Hypothesis", and the catch-up of less developed countries is called the "Catch-Up Process".

According to Solow, saving has no effect on the growth rate in the long run. In the long run, the main determinant is technological progress. Since the production function is constant and the marginal returns of the factors are decreasing, the per capita income growth will stop at some point. However, if the only factor that can postpone this steady-state is technological progress (Solow,1956:65-94).

Another important point to be mentioned about the Solow model is the technology exogeneity. Since the model is expressed in diminishing returns to scale, when the model becomes steady-state, the basis that determines the economic growth factor is the change in technology and the rate of population growth (Kar ve Ağır, 2006: 53).

The basic assumptions in this hypothesis are that the reason for the difference in growth rates that cause development difference between countries is that countries have different factor equipment and the decreasing marginal productivity of capital. The hypothesis states that there is a flow of capital from the developed country to the undeveloped country. The reason for this is that the return of capital in a developing country where capital is scarce is higher than in a developed country. Differences in interest between countries trigger capital movements. The international capital movements that occur will, over time, eliminate the interest differences between countries. In addition, while technology is constant and exogenous, in an economy where capital increases faster than the labor force, interest rates will decrease, and the developed country will eventually be caught, as the developing country will grow faster than the developed country. Since the factor equipment of the countries is different, even an investment to be made at the same time will cause a higher product increase in the developed country in the developing country (Kibritçioğlu,1998).

Solow's model is important in terms of transition to endogenous growth models. Solow states that in the neoclassical growth model, labor and capital can replace each other, taking into account the changes in the volume of labor. Solow proves that growth cannot be unstable due to variable factor ratios and flexible factor prices. According to this model, population growth and technological progress constitute the source of growth. According to Solow, labor is an exogenous factor and increases with population growth (Savaş,2000:853).

1.2.4. Endogenous Growth Models

Neoclassical growth theory, which links economic growth with the increase in capital and labor force and technological development, has been insufficient in identifying and analyzing the factors affecting economic growth (Özsağır, 2008). This led economists to conduct new research and analysis. Studies have drawn attention to more emphasis on micro bases and other factors besides traditional magnifying factors (Fine, 2000: 245). In this approach, which is called endogenous growth theory or new growth theory, growth is explained by endogenous factors rather than previously accepted as exogenous factors (Romer 1994: 3).

In neoclassical growth models, the steady growth of the economy depends only on exogenous technological developments. In the neoclassical production function, production factors are based on the principle of diminishing returns to scale. And therefore, developed countries go into a steady-state over time, and developing countries catch up with them. However, in practice, developed countries are more stable and continue to grow. However, if it is assumed that the production factors work with the principle of increasing returns to scale in Neoclassical growth models, the growing phenomenon predicted by the model fundamentally changes. The starting point of endogenous growth theory is that physical capital and human capital works on the principle of increasing returns to scale (Yülek, 1997:5). Neoclassical growth theories explain economic growth with labor, capital, and technology. In other words, economic growth is linked to the increase in production factors and the productivity of these factors. However, many empirical studies have revealed that the quantitative increase in production factors does not have as great an effect on economic growth as it seems, and therefore cannot explain economic growth adequately. Of some growth economists who see this inadequacy, P. Romer and R. Lucas pioneered the endogenous growth theory. Studies on economic growth in recent years are aimed at explaining the loss element of growth. Endogenous growth theories also reject the exogeneity of technological developments and include this in the model (Karabulut ve Emsen, 1997:11).

Endogenous growth models explain the contribution of knowledge to the economy in two basic terms; The first of these concepts is the positive exogeneity created by knowledge and technology. Regardless of the level, the created information can be acquired and used by different sectors, and efficiency can be achieved by

processing with different processes. This leads to knowledge accumulation in the process. The second basic concept is that information provides an increasing return to the scale (Ercan,2008:130).

As endogenous growth models, Rebello growth model (AK model), Romer-Arrow growth model, Lucas growth model, Barro growth model and finally R&D model (Romer) will be examined in this section:

The AK model is based on the Harrod - Domar model, which links the increase in labor to capital increase proportionally (Aghion and Howitt, 1998: 24). Apart from that, since the AK model has become widespread with Robello's (1991) work, it was deemed appropriate to consider the AK model within the framework of Rebello's model.

The AK growth model is the simplest in endogenous growth models. The AK model is based on the assumption that the returns to capital will not decrease while the stock of capital increases. Since there are no diminishing returns to scale in the production period, high capital accumulation will continuously increase investments, and the economy will continue to grow (Yılmaz and Akıncı,2012:84).

Cobb-douglas production function:

$Y = AK^{\alpha}L^{1-\alpha}$ and, 0<α<1. (1.28)

If α=1, then Y= AK.

In this production function, "*A*" indicates technology and "*K*" indicates the capital stock. According to this equation, economic growth depends on capital accumulation rate and technology level. According to the AK model, even in the absence of technological progress, per capita output will continue to increase. With this view, the Ak model differs from the Solow model. If the savings rates are high and the population growth rate is low, the growth rate will also increase. Since the increase in the savings rate will accelerate economic growth, following policies with incentives will ensure that growth becomes permanent (Taban,2008: 49).

AK model is a basic way to denote endogenous growth. Under full employment case and assuming a closed economy, investments equal savings. The savings are a

function of income. The capital depreciates at a constant rate, and it is denoted as "δ". The change in capital stock can be shown through the following equations:

$$I = S = sY = sAK \tag{1.29}$$

The change in capital stock $\dot{K}$ can be expressed as :

$$\dot{K} = sY - \delta K \tag{1.30}$$

The growth of capital stock can be found by dividing both sides of the equation in capital stock with "*K*":

$$\frac{\dot{K}}{K} = \frac{sY}{K} - \delta \tag{1.31}$$

Since, Y=AK,

Y/K =A, therefore, the above equation can be rewritten as:

$$\frac{\dot{K}}{K} = sA - \delta \tag{1.32}$$

As the growth of output is equal to the growth of capital stock and assuming that $s.A > \delta$, the growth of capital stock and output growth, shows that the economy will be ever-increasing compared to the Solow model.

Endogenous growth models a turning point in literature with Romer (1986). Later, Romer (1990) finalized an endogenous growth model based on R&D with his work. Romer's (1990) model is also a human capital-oriented model. Because the factor that develops technology in the model is research and development (R&D) activities, and these activities are undoubtedly carried out by individuals with knowledge and skills (Sianesi and Reenen, 2003: 163; Leeuven, 2007: 14).

Important assumptions on which the neoclassical model is based have been abandoned in Romer's model. Accordingly, in the growth process, increasing marginal factor productivity and increasing returns to scale are valid. These production functions suggest the opposite of models based on the assumption of diminishing returns. According to the model, the growth rates increase over time. As the physical and human capital stock increases, in the long run, the rate of return on investment and capital also

increases. In addition, technological development is determined endogenously. Romer argues that endogenous growth will be based on the knowledge resulting from investments. The idea that knowledge will also emerge as a result of the investment is mostly inspired by Arrow's concept of learning by doing. Accordingly, the more people do their job, the better they learn that job. This situation will increase per capita productivity over time, and hence production will start to accelerate (Yülek,1997:8).

Arrow (1962) is one of the valuable economists who introduced the concept of "learning by doing". Arrow stated that with the increase of experience and the advancement of technology, knowledge is constantly increasing. According to Arrow, education and research institutions should be established to improve the education level of people. Arrow put forward that the “learning by doing” argument leads to an increase in the firm's knowledge accumulation and capital stock.

Romer (1986) set up a model based on Kenneth Arrow‟s article published dated 1962. Thus, this model is called as Arrow-Romer Model, as well. Increasing saving rates can boost economic growth, just as in the AK model. There is no convergence hypothesis in this model. According to the Arrow-Romer model, when investing in a company, other companies will benefit from it. It is expressed as a positive externality in the literature (Ünsal, 2007).

Romer emphasized an extremely important issue by saying that if you combine your capital with knowledge and skills, the law of diminishing retun loses its effect (Romer, 1986). In the model, information is accepted as a separate production factor. The truth obtained through knowledge, learning, observation, and research; is an intellectual product that emerges as a result of the study of human intelligence. Since obtaining new information requires systematic study, using the information involves a cost. A company can gain a competitive advantage, and maintaining its superiority depends on access to new information.

In Barro's model, another endogenous growth theorist, it is assumed that the goods and services provided by the public sector are one of the production factors. In the model, increasing marginal returns of factors and increasing returns to scale occur depending on public policies. Accordingly, the goods and services provided by the public sector are also considered as production input (Barro,1991:103).

There is a constant return to scale in the model, and the production function is as follows:

$$y = f(k, g) = Ak^{1-\alpha} g^{\alpha} \quad (1.33)$$

and,

$$g = \tau y = \tau A k^{(1-\alpha)} g^{\alpha},\ 0 < \alpha < 1 \quad (1.34)$$

In the model, g indicates the expenditures of public goods and services, and k covers physical and human capital in a broad sense, as well as knowledge of the private sector. g/y will maximize growth rate. τ is the constant, average income tax and marginal income tax is equal. (Barro,1990).

Barro, it is observed that growth is positively affected when governments do not seek profit but work in a way to increase the welfare of the country. However, when governments consider their own benefit under election anxiety, growth and welfare have a negative impact. Public investment helps increase the net marginal productivity of private capital by compensating for private investment shortcomings. This situation develops in favor of economic growth. However, the disadvantage of this situation is that as public investments are financed by taxes, taxes will have a negative effect on growth after a while (Şan,2007:39).

Lucas argued that with the inclusion of human capital in the model, the marginal returns of the factors would increase, and thus growth will occur (Lucas, 1988: 3-42). According to Lucas, with the increase in the knowledge and skills of the employees, while the productivity of the individual increases, on the other hand, a faster increase in production will occur with the exogenous effect. By adding human capital to his model, Lucas never ignored the importance of physical capital while emphasizing the importance of people's knowledge and skills for growth. For this reason, human capital has taken place together with physical capital in Lucas's model. According to the model, due to the positive externality created by education, the law of decreasing efficiency in the growth process does not work. For these reasons, if the tendency to save increases in an economy, then the capital stock and growth rate will increase(Unay,1999:413).

The Lucas model is as follows:

$$Y = F(A, K, N^e) \quad (1.35)$$

In the model, *Y* is expressed as output, *K* is physical capital and active labor is N^e. And, *A* is represented technology.

$$N^e = uhN$$

Here, "*h*" indicates the average skill level. *"N"* refers to the number of workers and "*u*" to the time used for production. And, (1-*u*) shows human capital accumulation. If the production function is rearranged according to N^e, the equation will be as follows:

$$Y = F(A, K, uhN) \quad (1.36)$$

$$Y = AK^{\beta}(uhL)^{1-\beta} \quad (1.37)$$

Lucas's model, also, includes an exogeneity in human capital;

$$Y = AK^{\beta}(uhL)^{1-\beta}h_a^{\gamma} \quad (1.38)$$

h_a^{γ} represent the exogeneity of average human capital. This indicator expresses the exogeneity of information exchange between people (Salai-Martin, 1990)

According to Lucas, when employees spend all their time in production, workers do not have the opportunity to improve their skills, and human capital accumulation becomes zero. Conversely, when employees devote all their time to improving their skills, human capital rises to the highest level.

The world is going to a production structure where knowledge is the most important production factor. Therefore, R&D is now an integral part of the production process. While there are diminishing returns to scale in traditional factors of production, increasing returns to scale in technological development is in question—the marginal efficiency of capital declines over time. Therefore, industrial innovation is the engine of economic growth in the world economy (Yay, 2000:184).

The production function in the Romer Model is;

$$Y(t) = ((1 - \alpha_K)\, K(t))^{\alpha}((A(t)(1 - \alpha_L)L(t))^{1-\alpha}, 0 < \alpha < 1 \quad (1.39)$$

Here α_L, denotes the labor in the R&D sector. (1-α_L) represent the labor in good producing sector. Knowledge is producted with capital and labor devoted to R&D (Romer,2012).

$$\dot{A} = B(\alpha_K K(t))^{\beta}(\alpha_L L(t))^{\gamma} A(t))^{\theta},\ B > 0,\ \beta \geq 0,\ \gamma \geq 0, \quad (1.40)$$

where B is a shifting parameter. θ refers to the effect of existing knowledge stock on R&D.

Model, saving rate and population rate are constant and exogenous,

$$\dot{K}(t) = sY(t) \quad (1.41)$$

$$\dot{L}(t) = nL(t) \quad (1.42)$$

The capital accumulation equation,

$$\dot{K}(t) = s(1 - \alpha_K)^{\alpha}(1 - \alpha_L)^{1-\alpha} K(t)^{\alpha} A(t)^{1-\alpha} L(t)^{1-\alpha} \quad (1.43)$$

Special emphasis on research and development activities in R&D models are given. With the advancement of technology, the increase of knowledge, and the differentiation of goods, the variety of products increases, or existing products are developed. Increasing the variety of consumer products contributed positively to economic growth (Üzümcü, 2012: 262). The concept of innovation is of great importance for R&D models. Technology, which is seen as the driving force of growth, means producing new products or improving existing products.

The R&D approach focuses on the differentiation of information and goods in economic growth. Information is partly a public good. Knowledge production has a higher social return than the private return. In this case, subsidies to be allocated to research will lead to an acceleration of economic growth. On the other hand, new technology and new product cause old goods to be out of use, which can be considered as a negative externality in a sense (Öğüt, 2003: 30).

1.3. Human Capital

Human capital is defined as the sum of knowledge and skills contained by the labor force participating in production (Atik, 2006: 6). The concept includes the gains that individuals obtain through knowledge, skills, abilities, and partly through education and includes the strength and vitality they achieve depending on their health and nutritional status (Appleton and Teal, 1998: 9). Since this study is related to human capital's health dimension, the relationship between human capital and economic growth is given in detail below.

1.3.1. Human Capital and Economic Growth

The issue of economic growth and development has been the focus of intense interest and discussion with the Classical theory that started with Adam Smith, the Keynesian theory developed with Keynes and the Neo-Classical theory developed in the 1960s. However, the theories put forward could not explain the developments in the world sufficiently, and after a period of lethargy stretching back to the 1980s, it has become an important issue that is discussed again with the emergence of new theories called Endogenous Growth Theories (Keskin, 2012:146). Although pioneering studies on human capital are accepted as Smith, Marshall, and Mill's work in the economics literature, the views of these economists have not been very influential in modern human capital theory. As a matter of fact, Marshall stated that human capital would not be economically meaningful since it does not have a market, and its effects cannot be measured. Mill also argued that wealth is for people, and therefore people should not be seen as a source of wealth. Smith emphasized the importance of education and emphasized that a qualified workforce can be an important factor in economic development by accepting the acquired skills of individuals in a society as capital is considered as an important development in terms of human capital concept (Yumuşak, 2008: 8). Classical economists did not see labor as different from capital goods or production goods with the industrial revolution. As long as it contributes to profit, labor value is recognized; otherwise, labor is considered worthless. Political economists such as A. Smith, K. Marx, J.S. Mill, and A. Marshall also accepted that development is for human beings and did not see humans as a means of production. However, they did not emphasize the concept of human capital as much as it is today (UNHDR, 1996: 45).

In the first studies examining the effects of human capital on economic growth, health and labor transfer were generally neglected and focused on the relationship between education and economic growth. It is possible to trace the explanations about the relationship between education and economic growth back to Adam Smith's "Wealth of Nations"(Eser ve Gökmen,2009:50).

According to Adam Smith; The main source of economic growth is a division of labor and specialization. As the workforce specializes in a more specific area, they will know more about that job than anyone else, and their productivity will increase by doing that job better. This will positively affect economic growth by increasing social welfare (Karadeniz, 2007: 20–21).

While the classical growth theory explained growth by labor and capital increase, the Neo-Classical growth theory added capital per labor and technological development. In this context, the concept of "human capital," which constitutes the infrastructure of technological development, has come to the fore as the driving force of growth in recent years (Keskin, 2011: 141).

Although the roots of the concept of human capital go back a long way, it emerged as the driving force of economic development in the 1960s, its importance gradually increased in the last two decades and began to be the subject of serious studies within the framework of endogenous growth theories and human capital theory. The role of human capital in economic development is still extensively studied theoretically and empirically in the literature (Keskin,2011:141).

In the 1960s, economists such as Schultz, Denison, and Becker developed the human capital theory based on Smith's views. In his study for the USA economy, Denison stated that education increases the workforce's skills and productivity and thus contributes to the increase of national income. On the other hand, Shultz reached the same results as Denison and emphasized the importance of investments in education in growth rates in the USA (Kar and Ağır, 2006: 56). From the beginning of the 1960s, with Schultz and Denison's theoretical and practical contributions, one of the leading researchers in this field, while some of the economic growth was explained by physical capital, some of it began to be explained by human capital (Schultz,1967:132). Thus, human capital has taken its place in the development of economics literature under

Human Capital Theory's title in line with the neoclassical growth theory. In this theory, it is emphasized that besides physical capital, human capital is more importantly, effective on economic growth, and the educational dimension of human capital is analyzed (Hornbecklsalamon, 1991:7). Empirical studies also emphasize the positive contribution of education to economic growth. For instance, in a study conducted by Schultz (1961), in which the growth in the US economy was examined in the period 1929-1957, it was concluded that approximately two-thirds of the economic growth rate could not be explained by the production factors and the share of education within these residual factors ranged between 36-70%. Similarly, Denison (1962) found that education increases skill and productivity and contributes to a 23% increase in production.

Neoclassical growth theory is based on the work of Solow (1956) and Swan (1956). In studies based on Neo-Classical economic theory, the effect of human capital elements on economic growth is determined by the Cobb-Douglas production function (Varsak and Bakırtaş,2009:50).

Since the early 1980s, the emergence of knowledge and technology-intensive production has drawn attention to the increasing importance of human capital in development processes (HERS, 1998: 39).

In the endogenous growth model, the following function is generally used as the production function:

$$Yi=A(H)\ F(H,L,R) \quad .. \quad (1.44)$$

In the model, income is represented by *Y*, and *A(H)* refers to the technology included in education, *H* to education, *L* to unskilled labor, *R* to R&D, and *A* technological knowledge.

The effect of human capital on economic growth has been studied mostly in endogenous growth theories. The best known endogenous growth theories are based on the model developed by Robert E. Lucas (Atik, 2006: 46).

Studies based on endogenous growth models based on human capital accept human capital as a distinct production factor and, more importantly, as a factor contributing to sustainable economic development by increasing the efficiency of other

inputs and technology (Çakmak ve Gümüş, 2005: 63). Lucas (1988) stated that the increase in the human capital of the individual increases his own productivity and contributes to the increase in productivity in other production factors. Also, he stated that governments' investments for the development of education and technological infrastructure will have a positive effect on human capital accumulation and will affect growth more than investments made in physical capital (Kibritçioglu, 1998: 19).

Lucas (1988: 18) emphasized that human capital will have a two-way effect. Accordingly, human capital primarily ensures that workers' productivity increases and provides more output with the same input. Besides, the main contribution of human capital to production is the externalities created by human capital. Accordingly, taking the externalities into account, contrary to the neo-classical assumption, will ensure that the production is realized the increasing returns to the scale, and contrary to the prediction of Solow (1956), the steady-state of the production will never be reached (Serel and Masatçı, 2005:50).

The approach pioneered by Romer (1990), Grossman and Helpman (1991), Aghion and Howitt (1992) emphasizes that human capital affects growth through the development and adoption of new technologies. Based on the authors' views, the new growth literature develops analytical models in which specific industrial production activities and technical skill distribution lead to growth, based on the importance of representation of knowledge-based economic conditions (Yeldan, 2012: 23-24).

Apart from these, Mankiw, Romer, and Weil (1992: 416) extended the Solow (1956) model with human capital and indicated that human capital is at least as sprominent as physical capital in terms of growth. According to MRW's studies which involves 98 countries for the years between 1960 and 1985, as a result of Solow's model's expansion by adding human capital, besides the significant direct contribution of human capital to growth, the capital's effect is higher than what Solow stated. Besides, in the MRW model, it is shown that the convergence hypothesis criticized by the endogenous growth models is valid. Still, this process will take a longer time due to the countries' different human capital accumulations (Serel and Masatçı,2005:51).

In the approach of Mankiw, Romer, and Weil (1992), the Solow model developed with human capital. The production function be:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} (A(t)L(t))^{1-\alpha-\beta} \quad (1.45)$$

"*H*" is the stock of human capital, "*Y*" is output, "*K*" is capital, "*L*" is labor, and "*A*" is technology. "*L*" and "*A*" are assumed to grow exogenously at rates.

$$\dot{k}(t) = S_k y(t) - (n + g + \delta)k(t) \quad (1.45)$$

$$\dot{h}(t) = S_h y(t) - (n + g + \delta)h(t) \quad (1.47)$$

Where y=Y/AL, k=K/AL, and h=H/AL are quantities per effective unit of labor. They assumed that $\alpha+\beta<1$ (which is decreasing returns to scale). At that point, there is no steady-state for this model. Equations (4) and (5) imply that the economy converges to a steady-state specified by

$$k^* = \left(\frac{S_k^{1-\beta} S_h^{\beta}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)} \quad (1.48)$$

$$h^* = \left(\frac{S_k^{\alpha} S_h^{1-\alpha}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)} \quad (1.49)$$

They take logarithm and give an equation for income per capita.

$$\ln\left(\frac{Y(t)}{L(t)}\right) = \ln A(0) + gt - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n + g + \delta) + \frac{\alpha}{1-\alpha-\beta}\ln(s_k) + \frac{\beta}{1-\alpha-\beta}\ln(s_h) \quad (1.50)$$

This equation illustrates how per capita income depends on population growth and human and physical capital accumulation. The augmented model estimate coefficients in the equation that are functions of the factor shares. α is physical capital's share of income and β is human capital's share of income. They first ignored the human capital in the equation. They assumed that $\alpha=\beta=1/3$, then the coefficient of $\ln(s_k)$ would be 1. They concluded that higher saving leads to higher income, leading to a higher steady-state level of human capital, even though the proportion of income dedicated to human-capital accumulation remained unchanged. Thus, the existence of human-capital accumulation increases the effect of physical capital accumulation on income.

Similar studies have also been performed in Turkey. Generally, it is possible to collect the researches in two points; first one; Whether there is a relationship between economic growth and human capital; second, whether human capital accumulations contribute to economic growth or not (Karataş and Çankaya,2011:108).

Ateş (1998), in Turkey, by working with annual data for the period 1960-1994, extended the Solow model with human capital, analyzed the explanatory power of economic growth. Ateş concluded that in the Solow model extended with human capital, the explanation power of the change in economic growth is greater than the unexpanded Solow model (Varsak and Bakırtaş,2009:51).

Yumuşak and Tuna (2000) have studied the relationship between human capital and economic growth. They examined the indicators in this index and Turkey's human capital index. Among the 93 countries, Turkey is thirty-ninth and compared with similar income countries have revealed that the lower levels of education and health indicators.

Canpolat (2000) examined the relationship between human capital and economic growth in Turkey. He stated that despite the increase in the number of high schools and college students observed between 1950-1990, there was no significant increase in the capital stock per worker. Besides, the contribution of human capital to economic growth was found to be approximately forty percent. This indicates that returns to human capital investments are high.

Çakmak and Gümüş (2005) by using the number of graduates from primary, secondary, and higher education, a human capital index has been developed for Turkey. With this index's help, they analyzed the long-term relationship between human capital and economic growth econometrically by using annual data for the period 1960-2002. According to the results, there is a long-term positive relationship between human capital and economic growth in Turkey's economy. However, the contribution of human capital to economic growth in Turkey has lower rates than physical capital. They argued that this might be the inability of the existing human capital to adequately meet the economic needs or the migration of highly qualified human capital because of not finding employment.

Taban ve Kar (2006) aims to examine the causality between human capital and economic growth. Unlike other studies, the human capital index, schooling rate,

education, and life expectancy indexes are used as human capital indicators. According to empirical results, they stated that the causality relationship between human capital and economic growth differs according to the selected human capital indicator.

Today, new development indicators aim to reveal the multifaceted relationships between social, economic, and political factors. Social indicators such as average life expectancy in a country, literacy rate, education level, infant mortality rate, daily calorie intake, number of doctors per person emerge as new parameters of development (Keskin, 2011:134).

Although the increase in physical capital affects growth positively, more effective use of increased physical capital requires more human capital accumulation (Çakmak and Gümüş, 2005: 61; Benhabib and Spiegel, 1994: 165). Increasing the skilled workforce will enable the use of increasing physical capital more effectively and efficiently. In other words, human capital influences economic growth by increasing the efficiency of physical capital, increasing productivity, creating employment opportunities, providing technological development, and spreading effects.

Human capital, usually created through education, can occur spontaneously through learning through work (Taban and Kar, 2006: 163). According to the economists, learning by doing and vocational training (workplace training) are also as effective as the formal knowledge given in schools (Lucas, 1988: 27). The fact that individuals can get an education and continue an economic activity depends on their health. Although education is the primary source of human capital, society's health level is also an essential factor in forming human capital. Hence, while examining the concept of human capital, academic studies also consider the health system with the education system. Recently, some academic studies consider health expenditure apart from the education system to identify its effect on economic growth.

1.4. Health Expenditure

Even if its effect could be seen in the long term, health services provided to the people in society provide many benefits. The healthy person becomes efficient and involved in many productive activities. In addition to health, the positive effects of the investments made in the field of education on the economic conditions of the countries

were determined, and it was determined that healthy and educated people behave more rationally and effectively in society (Muskhin, 1962: 156).

1.4.1. Importance of Health Expenditure

While the health level of the society increases with health expenditures, economic growth increases with the increase in production in the country over time due to the contribution of health expenditure to human capital. In this context, human capital refers to the sum of the concepts such as skills, knowledge, and education level of the society or individuals.

Consistently, Bloom and Canning (2000) stated that healthcare spending accelerates economic growth by stating that healthy individuals increase their productivity at work and positively affect human capital and encourage investments. Hence, related literature illustrates that the relationship between economic growth and health spending is bilateral and positive. This positive effect of health expenditures on economic growth is called the "health-based growth hypothesis". According to this hypothesis, health expenditures are productive capital. In other words, any investment in the health sector contributes to the economic growth of the country (Foon Tang, 2011 p.201).

Although there are many studies examining the relationship between health expenditures and economic growth, this study examined the relationship between health expenditures and economic growth after the health transformation program(2003) in Turkey.

1.4.2. Determinants of Health Expenditure

While conducting their analysis, health economists face some problems in terms of which expenditures are accepted as health expenditures. Whether the rapid increase in the expenditures for medical care and cosmetic purposes, as well as therapeutic and conservative health services, will be counted as health expenditures is a matter of great debate. It is difficult to create an index that shows how much the recreation activities and the cures applied for slimming are included in the health expenditure item together with the cosmetic expenditures such as fat removal and hair transplantation (Tokalaş, 2006: 25).

However, while health expenditures of countries are compared at national level, accepted standard definitions have been established in the literature. Commonly accepted among these standards are the ratio of health expenditures to GDP, health and drug expenditures per capita, and the share of drug expenditures in health expenditures. Thanks to these accepted definitions, changes in expenditures and trends towards certain periods can be compared with the values of different countries (Smith, 2006: 35).

1.4.3. Health Expenditure and Economic Growth

Many studies on growth have illustrated that health positively affects economic growth (Parasız, 2008: 47). In this context, health services are also considered an investment in

human capital because of improving the work's efficiency by protecting and improving the human's ability to work (Taban, 2006: 35). The longer life expectancies of individuals increase with the increase in spending on health services. Life expectancy at birth has an important effect on increasing private capital accumulation and increasing economic growth (Glomm and Ravikumar, 1997: 201). The fact that the individuals who make up the society are healthy and long-lived means that human capital can be used longer.

In recent years, health spending has increased significantly in developed and developing countries that prioritize social welfare (Rhee, 2014: 19). Today, health spending differs according to the development levels of countries. Countries that have developed and reached a certain level of welfare can allocate more shares from GDP to protect, develop, and treat human health. Especially in developed countries, health spending is relatively higher than in developing countries. While some countries allocate around 2% of GDP for healthcare expenditures, this rate can reach 17% (like the USA) in developed and high-income countries (Tıraş, 2018: 89).

Health expenditures will reduce the health problems that will arise in the future by protecting the working power, and in the long run, it will save on possible health expenditures (Yumuşak and Yıldırım, 2009: 61). In this context, health expenditures are considered investment expenditures rather than simple consumption expenditures. When it comes to health investment, only health expenditure comes to mind. Keeping

health investments with health expenditures means that the country's health level is measured by the expenditures made in the field of health.

This study aims to analyze the relationship between health expenditure and economic growth. In this study, the effect of health expenditures on economic growth in Turkey is examined. Unlike other studies, the effect of the 2003 health transformation program is examined by adding the dummy variable. The theoretical and empirical literature on healthcare spending and economic growth is detailed below.

1.4.4. Literature Review of Relationship Between Health Expenditure and Economic Growth

Parkin et al. (1987) analyzed the relationship between health expenditures and national income. The study used the data published by OECD in 1985. The data related to healthcare expenditures includes, percentage of expenditure on institutional care, ambulatory care, pharmaceutical goods and therapeutic appliances as well as the number of healthcare professionals per 100.000 population. The data related to economic growth, the dependent variable in this study, is represented by GDP per person. By using regression analysis, the authors found that health care expenditures directly affect economic growth. Hence, they concluded that health care expenditures are not a luxury but a necessity for OECD countries.

Gerdtham and Jönsson (1991) analyzed the relationship between health care spending and economic growth. In order to reach their aim, the authors used the relative price of heath care and aggregate per capita income data in 1985. The data related to 22 OECD countries, including Turkey, is retrieved from OECD data base. The health care expenditure data includes the quantity of units of goods and services multiplied by their unit prices. The study has multiple findings. First, the authors found that the ratio of health care spending as percentage of per capita income increases with GDP. Second, their findings illustrate that health care spending is not higher in countries that have higher prices. Finally, the authors found that, the differences in health care spending between different countries persists after correcting relative prices and income level.

Gyimah and Wilson (2004) investigated the impact of total health spending in Africa and OECD countries on per capita income growth using the expanded Solow

model. Analyzes were conducted by using panel data and dynamic panel estimator. As a result, the authors find that, while other variables were fixed, total health spending had a strong and positive effect on per capita income growth. In addition, developments in health expenditures contributed to a 22% and 30% increase in per capita income in Africa and OECD countries.

Kıymaz et al. (2006) conducted an empirical analysis in order to analyze the long-term relationship between health expenditures and economic growth in Turkey. The study uses data between 1984-1998, which is retrieved from OECD Health Data 2002. Independent variables which represent the health expenditures consist of private, public and total healthcare expenditures, while dependent variable is represented by GDP and population growth. The cointegration test results illustrate that there is a positive long-term relationship between private public expenditures per capita and GDP. In addition, the causality test results illustrate that there is a one-way causality relationship from GDP to health expenditures.

Tang (2010) examined the health and income relationship between 1970 and 2009 in Malaysia. In his study, Tang used health spending, income and health price data. In order to reach its aim, causal and ARDL co-integration analyzes were performed with Rao's F-Test. As a result of the analysis, the author found that there is a one-way causality from national income to health expenditure. In addition, the border test results illustrate that real income and health expenditures are parallel in the long term. Finally, the author concluded that health expenditures for Malaysia are luxury expenditures.

Baltagi and Mascone (2010) investigated the long run relationship between health expenditures and economic growth in 20 OECD countries. They used panel data between 1971-2004 in order to study non-stationarity and cointegration properties. The data includes total health care expenditures as independent variable and per capita income estimated in GDP purchasing power parity as US Dollars. Their findings illustrate that health care expenditures in OECD countries are non-stationary and linked in the long run. Finally, the results show that health care expenditures are necessary in order to ensure economic growth.

Sülkü and Caner (2011)'s study aimed to analyze the relationship between GDP, health expenditures and population growth in Turkey. They used gross domestic product, per capita health spending and population growth data between 1984 and 2006. The authors used Johansen multivariate co-integration test to reach its aim. The results illustrate that a 10% increase in GDP is associated with 8,7% increase in health expenditures. In addition, the results of the study illustrate that the income elasticity of public health expenditures is less than one, while it is greater than one for private health care expenditures. Hence, the authors concluded that not public health care but private health care is a luxury in Turkey.

Pradhan (2011) analyzed the relationship between the health expenditure and economic growth of the 11 OECD countries. In his study, the author investigated whether there is a long-term relationship between the variables between 1961-2007 and the variables and causality relationship between the variables. After applying "Panel Data Analysis" method, it was determined that there is both short- and long-term mutual relationship between health expenditures and economic growth.

In order to explore the causality between health expenditures and economic growth, Wang (2011) conducted an analysis by using the data of 31 countries between 1986-2007. Healthcare expenditure data consist of international total expenditure on health, on personal health care and also on health/per capita, while economic growth data is represented by GDP in US Dollars. The research uses both panel regression analysis and quantile regression analysis. The results illustrate that there is a positive influence of health expenditure on economic growth especially for countries that have a medium and high level of economic growth.

Nyamwange (2012) analyzed the effect of per capita GDP on public health care expenditure in Kenya. The 30-year data used in this study belong to years between 1982-2012. As the analysis technique, this study employs ordinary least square regression and co-integration test. As a result of this study, it is found that health care in Kenya is necessary rather than a luxury. Furthermore, the results illustrate that 1% increase in GDP per capita results in a 0,024% increase in health care spending.

Elmi and Sadeghi (2012) analyzed the causality and co-integration relationship between health care expenditure and economic growth in 20 different developing

countries. They used the data between 1990-2009 retrieved from World Bank Database. The study adopted Pesaran and Shin unit root test, panel co-integration and causality in VECM framework. As a result, they found that there is a one-way short-run causality from GDP to health expenditures. Finally, this study confirms that the health-led growth hypothesis is supported for developing countries.

Akpolat and Altıntaş (2012) investigated the impact of the health factor on GDP in their studies covering the period 1970-2009 for 19 OECD countries with panel data analysis method. They analyzed the health spending, infant mortality and life expectancy variables as health variables. As a result of the analysis, it was found that the increase in health expenditures and the decrease in infant mortality rates had a positive effect on GDP in line with the theory. On the other hand, contrary to theoretical expectations, life expectancy in the east has a weak and negative effect on GDP. In order to explain their findings, the authors stated that most of the countries subject to research are developed countries, and that the expenditures made to meet the health needs of the population, which are older in these countries and exceeding the retirement age, affect the economy negatively after a certain level.

Kumar (2013) analyzed the relationship between health expenditure and economic growth by using GMM (Generalized Method of Moments) and Causality test. The data of OECD countries between 1960-2007 is used in the study. As a result of the study, GMM estimates illustrate that GDP has a positive contribution to health spending in OECD countries. In addition, the results of causality test illustrate that there is a two-way causality between economic growth and heath expenditure. The author concluded that the spending on public healthcare will have a positive effect on the wellbeing of population in the long run.

Sghari and Hammani (2013) analyzed the relationship between health care expenditures and GDP in 30 developing countries including Turkey. The data retrieved from World Bank database between 1975 and 2011. The results illustrate that there is a two-way causality relationship between health care expenditures and economic growth.

Mehrara and Musai (2013) investigated the causal relationship between health expenditure and GDP in Iran by using the Gregory-Hansen (1996) cointegration technique. Their study is based on annual data between 1970 and 2008. The results

illustrate that there is a long-run relationship between GDP and health expenditure, more specifically it is found that there is a one way causality from GDP to health spending. The finding that health expenditures do not have a positive effect on economic growth is attributed to the inefficiency of healthcare expenditures. The authors claimed that health expenditure in Iran increased at a faster rate than GDP after the revolution. Finally, the authors concluded that more effective health expenditure and accountable, incentives investments should be made by the government rather than reducing health expenditures and investments.

Ay et al. (2013) conducted an analysis by using GDP, number of health institutions, number of citizens per health official data between 1968-2006. By using cointegration test, the authors found that there is a positive relationship between health and economic growth. Further they found that increase in the variables related to health result in an increase in economic growth. Hence, the authors suggest that Turkey needs to focus more on policies related to increase developments in health sector in order to enhance economic growth.

Çalışkan et al. (2013) also aimed at analyzing the relationship between health and economic growth. In order to reach their aim, the authors used the number of patients per health official, the number of beds in hospitals, the number of hospitals and expectation of living after birth as variables of the study. By using the data between 1967-2010, the authors found a one-way relationship from health expenditures to economic growth.

Boussalem et al. (2014) conducted an analysis in order to investigate the relationship between Algerian public health spending and economic growth. In this study, "Granger Causality Test" was applied in line with the data between 1974-2014. As a result; it was revealed that there was a causality relationship between the variables in the long term and public health spending had an impact on economic growth. While no short-term causality from health care expenditure to economic growth, the authors suggest improving health status in Algeria.

Reeves et al. (2014) investigated the factors that affect health care expenditures. They used the data of 27 European Union countries from 1995-2011. They adopted multivariate random and fixed effects models in order to analyze the data retrieved from

EuroStat, International Monetary Fund (IMF) and World Bank. The results indicate that there is no significant relationship between health care expenditure and magnitude of economic recessions. On the other hand, every $100 decrease in tax revenue result in a $2,72 decrease in health expenditure.

Vaidean (2015) conducted an empirical analysis in order to explicate per capita health care spending of European Union member countries during a decade (between 2004-2013) by the per capita GDP and the ratio of citizens over 65. The dependent variable in this study was per capita health care spending. The study uses multiple linear econometric model. Panel technique, ordinary least squares method, fixed effects model and random effects model are used. The results of the study illustrate that there is a statistically significant relationship between per capita health care spending of EU countries and other macro-economic indicators. Hence, the authors concluded that the development level of a country is the main factor that affect the amount of health care expenditures.

Atılgan et al. (2016) conducted an empirical survey to analyze the relationship between health expenditures and economic growth. The authors used the data between 1975-2013 period. The data related to economic growth is represented by GDP and drawn from World Bank Data base, while the data related to health expenditures is retrieved from OECD Data base. In order to examine the co-integration between health expenditures and economic growth, the authors used autoregressive-distributed lag approach (ARDL) and Kalman filter modeling. The results illustrate that a 1% increase in health expenditure result in a 0,434% increase in economic growth. Hence, findings show that health care spending has a positive effect on economic growth in Turkey.

Yorulmaz and Tahsin (2016) analyzed the causality between health care and GDP as well as income elasticity of healthcare expenditure for Latin American and Carribbean countries. This study used infant mortality rates and the ratio of citizens over age 65 as data drawn from World Bank data base. The results illustrate that income elasticity of health care spending is less than one. Hence, health care is not a luxury for Latin American and Carribean countries. In addition, it is found that infant mortality rate and ratio of citizens over 65 influence per capita health care expenditure.

Similarly, Bedir (2016) analyzed the relationship between health expenditures and economic growth. The author used the data of developing countries in Europe and Middle East African Asian Countries between 1995-2013. In order to analyze the relationship between variables, the author adopted a modified version of Granger causality test proposed by Toda Yamamato. As a result, the author found a two-way causality relationship between health expenditures and economic growth for Czech Republic and Russion Federation sample. In addition, the results illustrate that there is a one-way causality from health expenditures to economic growth for Egypt, Hungary, Korean Republic, South Africa, and the Philippines, while there is a one-way causality from economic growth to health expenditures for Greece, Poland, the United Arab Emirates, China, Indonesia, and the Korean Republic. Considering his findings, the author argues that the income level has a direct effect on healthcare expenditures for some of the developing countries.

Başar et al. (2016) also conducted a study in order to analyze the relationship between health expenditures and economic growth in Turkey. They used the data between years 1998-2016 and found that there is a statistically significant relationship between health expenditures and economic growth. According to the results a 1% increase in health expenditure results in 1.13% increase in economic growth.

Doğan (2016) also analyzed the relationship between economic growth and health expenditures by using the data between 1960-2013. They used the total health expenditures as a variable. According to the results, the author found that there is a two-way causality relationship between economic growth and health expenditures.

Akıncı and Tuncer (2016) also analyzed the relationship between health expenditure and economic growth by using cointegration and causality tests together. They used the share of health expenditure in GDP as a variable. As a result of the analysis, the authors found that there is a long tern two-way relationship between economic growth and health expenditure. Meaning that, while health expenditures affect economic growth, economic growth also has a positive effect on health expenditures

Cebeci and Ay (2016) aimed at analyzing the relationship between health and economic growth. They used the data of BRICS Countries (Brazil, Russia, India, China

and South Africa) and Turkey between years 200-2014. As a result of panel data analysis, the authors found that health expenditures have a positive effect on economic growth in all countries.

Bedir (2016) aimed at analyzing the relationship between health expenditures and economic growth by using the data of 9 developing European and Middle East African countries as well as 7 Asian countries. Causality analyzes were conducted using per capita health expenditures and economic growth data between 1995 and 2013. According to the results, the authors found that there is a two-way causality relationship for the Czech Republic and the Russian Federation. On the other hand, they found a oneway relationship from income to health expenditures in Greece, Poland, the Republic of South Africa, the United Arab Emirates, Indonesia and the Republic of Korea. Finally, they found that there is no causality between health spending and economic growth for republic of Korea, Turkey, China, India and Thailand.

Erçelik (2018) analyzed the relationship between health care expenditure and economic growth in Turkey by using 1980-2015 data. The relationship between the ratio of healthcare expenditure to GDP and GDP per capita is analyzed by using ARDL method. The results illustrate that health care expenditure and GDP are co-integrated and there is a statistically significant relationship between these variables in the long-term.

Abegaz and Mohammed (2018) analyzed the relationship between health care expenditures and gross domestic product as well as the elasticity of health care expenditures. The authors used Ethiopia's health care expenditure and GDP data between 1995-2014. In order to analyze the relationship between health care expenditure and GDP, this study adopted augmented dickey fuller test and Johansen co-integration test, while the elasticity of healthcare expenditure is analyzed by using ordinary least squares, least absolute deviations, least mean squares and M-estimator methods. The results illustrate that health care expenditure and GDP have a co-integration in the long term. Furthermore, the income elasticity for health care expenditure is less than one, meaning that health care spending is a necessity rather than a luxury for Ethiopia.

Lee et al. (2019) conducted an analysis to investigate the stationarity and co-integration of health care spending and gross domestic product for OECD countries. This study uses the data of health care spending and GDP of 20 OECD countries. In addition, the income elasticity of health care spending is also analyzed. The results of the analysis illustrate that, both health care spending and GDP are non-stationary. In addition, the authors found a stochastic co-movement between health care spending and GDP in 14 of countries analyzed as part of this study. Finally, the results illustrate that in 13 out of these 14 countries the income elasticity is higher than 1 implying that health care spending is luxury for these countries.

It is considered that the relationship between health expenditures and economic growth differs according to countries or regions as well as according to the periods in which the analysis is conducted. The importance of this situation was even better understood during the Covid-19 epidemic, which affected the whole world during the time this thesis is written. In this context, investigating the relationship between economic growth and health spending in Turkey, as a developing country, will yield beneficial results not only for policy makers but also for companies operating in the healthcare sector.

In addition, this study uses the population growth as another variable in order to identify its relationship withboth health expenditures and economic growth. According to the related literature, health expenditures has an important affect on decreasing infant and child mortality, decreasing birth and death rates, slowing down the population growth rate, increasing the average life span and increasing labor productivity by allowing individuals to eat healthier (Tıraş, 2018).Therefore, we believe that using population growth as an additional variable in this study yield considerable results and make a significant contribution to the related literature.

CHAPTER TWO

HEALTH EXPENDITURE IN TURKEY AND RELATIONSHIP WITH ECONOMIC GROWTH

2.1. The Structure of Health Expenditure in Turkey

In Turkey, health expenditures are funded by public and private sector resources. The health spending by the government includes spending the State, local government, and social security funds. On the other hand, private-sector health expenditures generally consist of payments by individuals from their out of pockets, companies' payments for their personnel, non-profit institutions' expenditures, and private health insurances (Özbay vd., 2007: 178). In Turkey, the proportion of health expenditure by the public sector and the private sector is seen in the table-1 for the period 1999-2019.

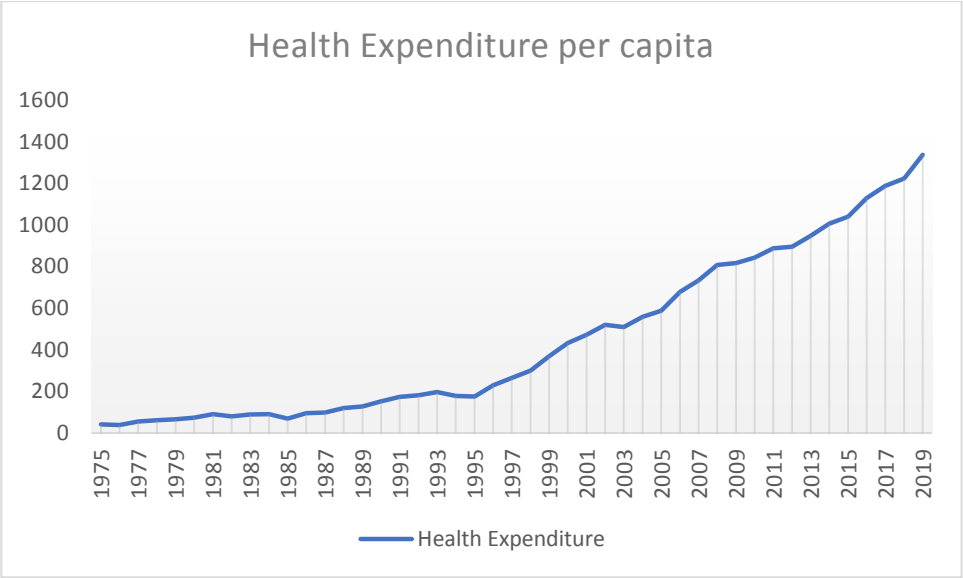
While private-sector spending on health has decreased over the last 20 years, public sector expenditure on health has steadily increased. Private health spending was 38.9% in 1999, and this ratio declined to 22% in 2019. On the other hand, the health spending by the government rose from 61.1% to 78%. It is seen that government spending on health in Turkey is higher than private-sector expenditure on health. The share of government health spending in total health expenditure is gradually growing. It can be concluded that the state is dominant in the health sector. Likewise, the number of public hospitals and hospital beds is higher than that of private hospitals and hospital beds.

Table 1: The ratio of public and private health expenditures in total expenditures (1999-2019) in Turkey.

Years	Ratio of general government health expenditure to total health expenditure (%)	Ratio of private sector health expenditure to total health expenditure (%)
1999	38,9	61,1
2000	37,1	62,9
2001	31,9	68,1
2002	29,3	70,7
2003	28,1	71,9
2004	28,8	71,2
2005	32,2	67,8
2006	31,7	68,3
2007	32,2	67,8
2008	27,0	73,0
2009	19,0	81,0
2010	21,4	78,6
2011	20,4	79,6
2012	20,8	79,2
2013	21,5	78,5
2014	22,6	77,4
2015	21,5	78,5
2016	21,5	78,5
2017	22,0	78,0
2018	22,5	77,5
2019	22,0	78,0

Source: TUIK, 2020

Health spending is growing globally due to increased life expectancy, an aging population, a rise in per capita income, an increase in the level of education, urbanization and technological developments, etc. Health expenditure has risen worldwide, especially in developed and developing countries, in recent years. Indeed, the growth rate in developed countries' health spending is higher than in underdeveloped and developing countries (Boz ve Sur, 2015: 25). Although the rate of increase in health spending lagging behind many developed countries, health spending is increasing in Turkey. The change in health expenditures per capita over the years is given in figure-1.



Source: OECD database, health expenditure per capita 1975 - 2019

Figure 1: Health expenditure per capita in Turkey (1975-2019)

As shown from the graph, health expenditures per capita have increased significantly, especially in recent years. While health expenditures per capita is 41.8 US dollars in 1975, health expenditure per capita increased to 1 337.2 US dollars in 2019. Health expenditure per capita has risen by nearly 32 times over the past 45 years. However, health spending has grown faster than economic growth, although it slowed down in the recessions.

Table-2 shows that the GDP per capita and economic growth rates between 1975 and 2019. Turkey's economy has undergone an economic recession and unstable growth due to the financial crisis and political issues in 1980, 1994, 2001, and 2009. As can be seen from the table, steady and balanced growth could not occur in Turkey over the years observed. Short-term economic growth in Turkey has resulted in economic decline after the financial crisis. Namely, Turkey's economy has not shown stable growth since 1980 and then entered a crisis period, which shows that almost every five years. Turkey has a growth rate of 7.17 in 1975; it has a negative growth rate in 1980 and has reached an extremely high growth rate of 9.4% in 1990. However, in 1991, the growth rate declined to almost zero. The Turkish economy, which got a high growth rate also in 1993, entered into a remarkable recession in 1994. Even if economic growth has occurred at varying rates between 1995 and 2019, due to the financial crisis in 2001 and 2009 and the earthquake in 1999, the Turkish economy experienced negative growth again.

Table 2: Current GDP per capita (US Dollar) and GDP growth rate in Turkey (1975-2019).

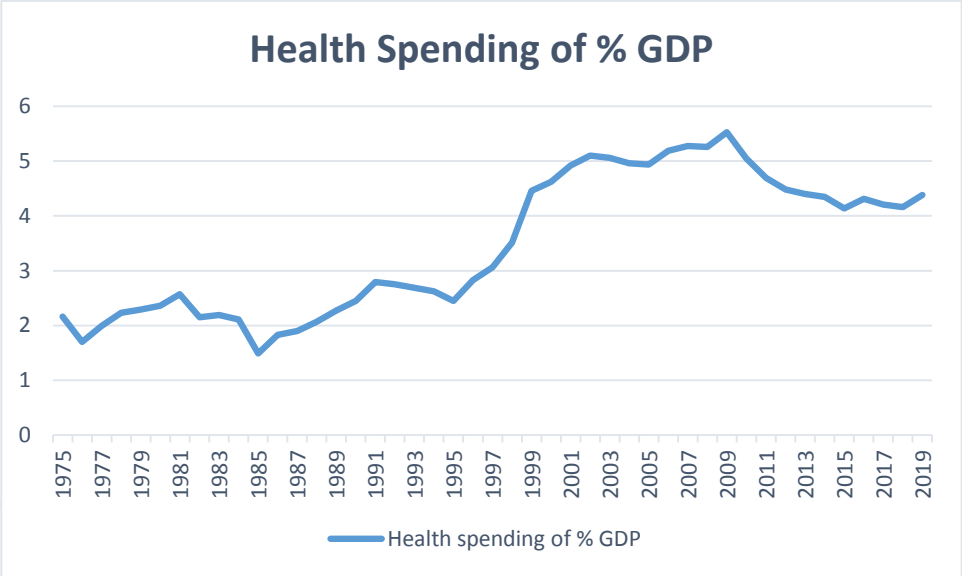
Years	Current GDP (US Dollar) per capita	GDP growth rate
1975	1 136	7,17
1980	1 564	-2,45
1985	1 368	4,24
1990	2 794	9,27
1994	2 270	-4,67
1995	2 897	7,88
1999	4 116	-3,26
2000	4 337	6,93
2001	3 142	-5,75
2002	3 687	6,44
2003	4 760	5,76
2004	6 101	9,80
2005	7 456	8,99
2006	8 102	6,95
2007	9 791	5,04
2008	10 940	0,82
2009	9 103	-4,82
2010	10 742	8,43
2011	11 420	11,2
2012	11 795	4,79
2013	12 614	8,49
2014	12 157	4,94
2015	11 006	6,08
2016	10 895	3,32
2017	10 591	7,50
2018	9 455	2,96
2019	9 126	0,92

Source: World Bank database, 2020.

It has been observed that health expenditures increased rather than decreased even in the period of economic crisis. The explanation for this can be laid out as follows:

- Health services are obligatory needs.
- Health expenditures are needs that cannot be postponed.
- Health services are a fundamental human right.

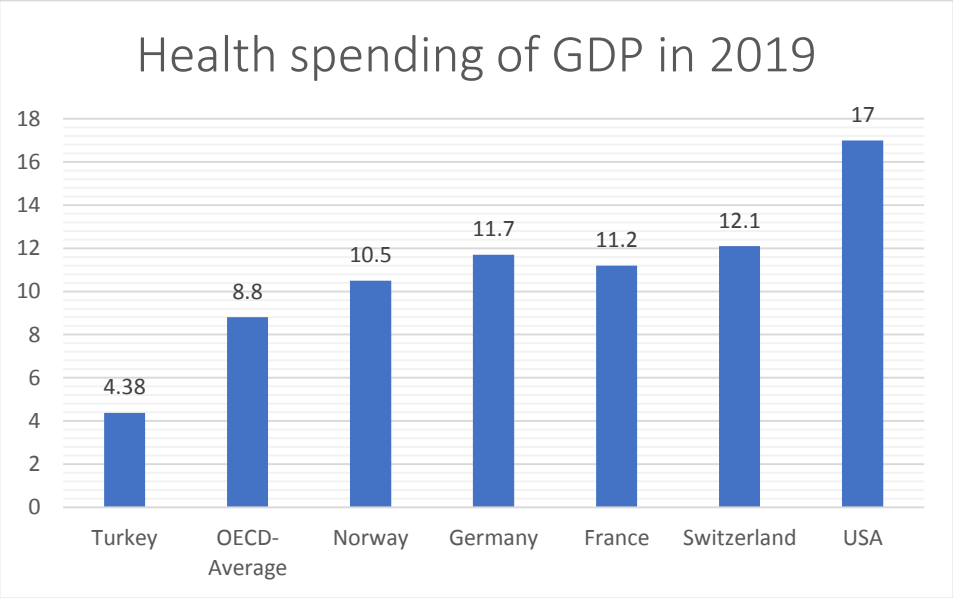
Therefore, while public health expenditures increase in crisis terms, private health expenditures decrease, and total health expenditures do not decrease for this reason. Due to the nature of healthcare services, the state has undertaken the burden of healthcare spending in times of crisis. In other words, in the economic crisis period, unemployment increases, and per capita income decreases; thus, people prefer public health services to private health services. This causes an increase in public health expenditures. So, especially during the economic crisis, the government increase health spending for those who cannot afford healthcare services.



Source: OECD database,2020.

Figure 2: The share of health spending of GDP in Turkey

The graph above shows the share of total health expenditures in GDP. It is an indicator obtained by dividing total health expenditures by the country's GDP. This indicator is an important measure showing how much share countries allocated to health expenditures from GDP. It has been observed that the share of GDP allocated to health expenditures is higher in high-income countries. Therefore, it can be said that this indicator is a measure that shows the development level of countries. As a matter of fact, the World Health Organization has set a standard on how many shares should be allocated to health expenditures from GDP and stated that the share allocated to health expenditures in a country should be at least 5% of the country's GDP. However, most of the time, Turkey remained below the level set by the World Health Organisation. While the share assigned to health spending from GDP is 2.16 in 1975, it hit the peak level with 5.53 in 2009. This rate has decreased after 2009. In 2019, the share of health spending assigned to GDP in Turkey was 4.38.



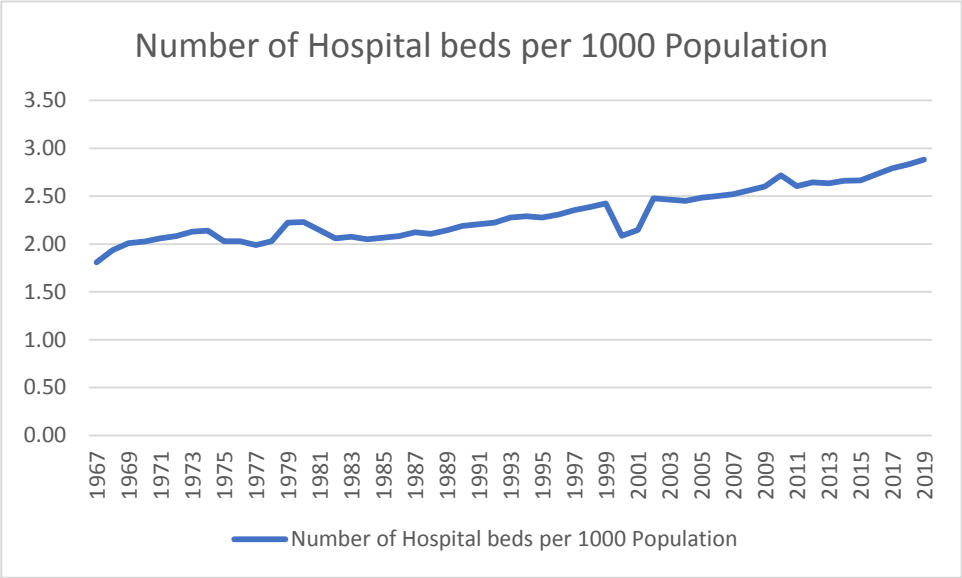
Source: OECD Database, 2020.

Figure 3: The health spending of GDP in 2019

Health expenditure is one of the most important development indicators of countries. It is a fact that the share allocated to health expenditures of GDP is higher in developed countries, and the increase in health expenditures is more than GDP growth. The share of GDP dedicated to health spending in Turkey is far behind many developed countries and the OECD average. Today, this share has reached 17% in the USA. Switzerland follows the USA with 12.1 percent, Germany with 11.7 percent, and France with 11.2 percent. When we look at the average of OECD countries, it is seen that this rate is %8.8. The share of health spending allocated to GDP is %4.38 in Turkey. It is a fact that Turkey is an OECD country that allocates a lower share of GDP to health expenditure.

2.2. The Indicators Related to Health Services in Turkey

Indicators such as the number of health professionals, the number of health institutions and, the number of resources allocated to the health system can also reflect societies' health levels. The health workforce, the health equipment such as the number of hospital beds and computed tomography, other resources devoted to health in turkey lag behind most OECD countries. The number of hospital beds as health equipment is significant as a measure of delivering health services to patients. The following table illustrates the number of beds per 1,000 inhabitants in Turkey between 1967 and 2019.

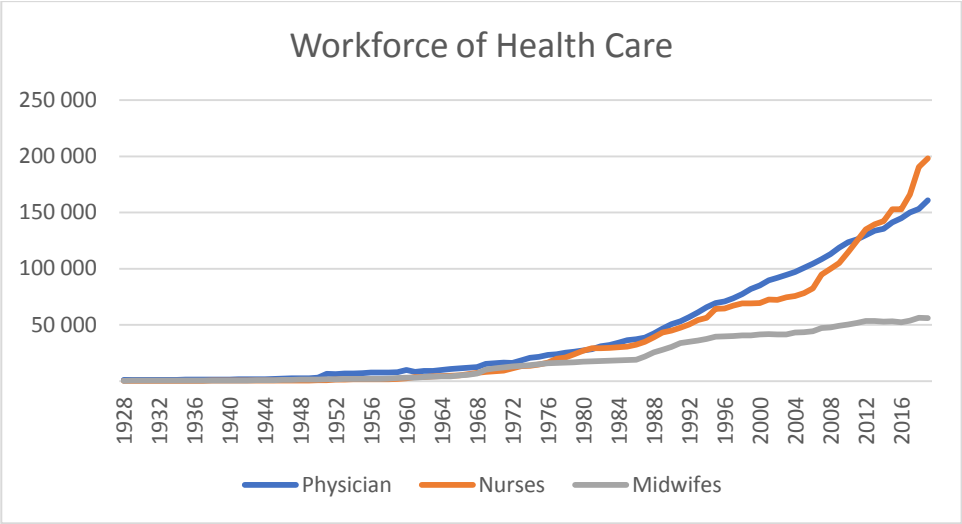


Source: TUİK, 2020.

Figure 4: Number of hospital beds per 1000 population in Turkey

The number of hospital beds per 1,000 people in the time span understudy is between 2 and 3.5. The increase in the number of hospital beds per 1000 people is a much more important indicator than the increase in the number of hospital beds. Although the number of hospital beds rose dramatically from 1967 to 2019, the rise in the number of hospital beds per 1,000 people is not adequate, as the population has increased between those years.

Unless the number of health personnel increases, the increase in the number of hospitals and other health institutions, the improvement of the buildings' physical structure, and the technology available will not show an improvement in the supply of health services (Orhaner, 2006: 4). The number of medical and nursing faculties in Turkey has increased in recent years. However, it is not possible to increase the number of healthcare personnel, such as doctors and nurses in the health sector, in a very short time because their education processes require a long period. Therefore, the supply of health personnel is rigid in the short term (Mutlu ve Işık, 2012: 97). Here, policymakers are advised to increase the number of faculties and achieve a qualitative improvement of the faculties. Changes in the number of health workers in Turkey over the years between 1928-2109 are shown in the below figure-5.

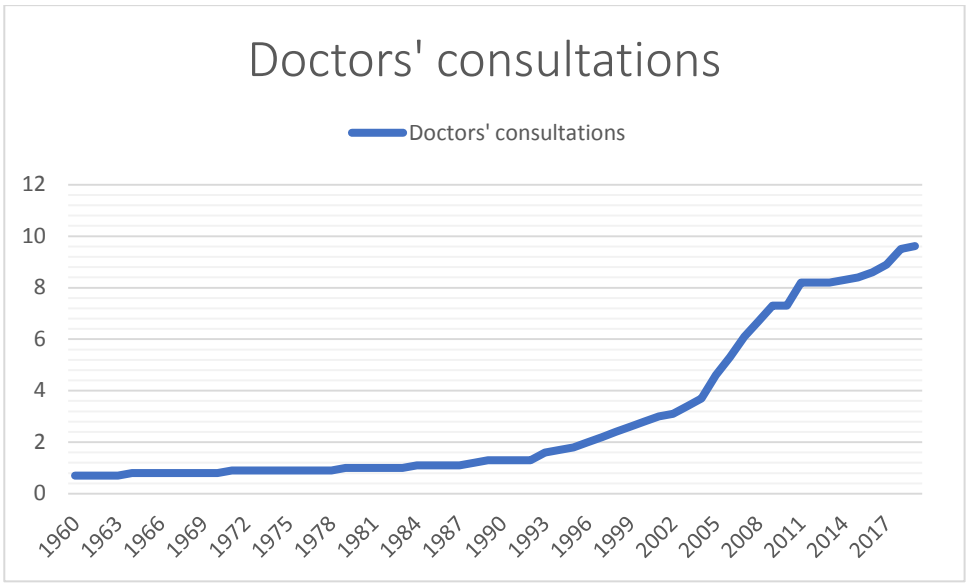


Source: TUİK, 2020.

Figure 5: Workforce of Health Care in Turkey (1928 – 2019)

As can be seen in the graph, the number of healthcare professionals has increased over time. Moreover, the number of doctors, nurses, and midwives per 1000 people has increased over the years. However, the increase in healthcare professionals is not adequate compared to most OECD countries.

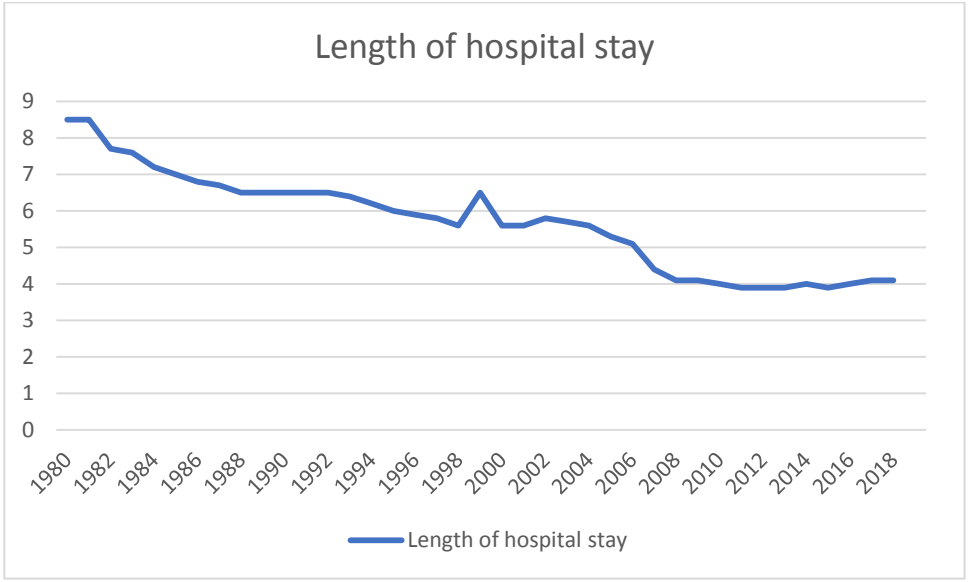
As an indicator of the utilization of health services, the physician consultation rate has increased in Turkey in recent years. The reason for the increase in the physician consultation rate in recent years can be shown as easier access to health services and performance-based fee payments to physicians with the change in health policies in 2003. Another reason can be shown as the low level of people's consciousness. The increase in the number of doctor consultations is a factor that increases health spending. The rate of consulting an unneeded physician may cause a waste of time and resources. Likewise, the increase in the number of physician consultations is a factor that increases the workload of healthcare professionals. Consultation rates to physicians in Turkey between the years 1960-2019 are given in the figure-6.



Source: TUİK, 2020

Figure 6: Doctors' consultations in Turkey between 1960 and 2019

As the figure shows, physician consultation rates increased in Turkey, and this ratio is higher compared to the OECD average. While the number of physician consultations per person was 0.7 in 1960, this rate increased to 3.1 in 2002 after 42 years. Only 10 years later, the doctor consultation rate per person was 8.2 in 2012, and the doctor consultation rate per person increased to 9.6 in 2019.

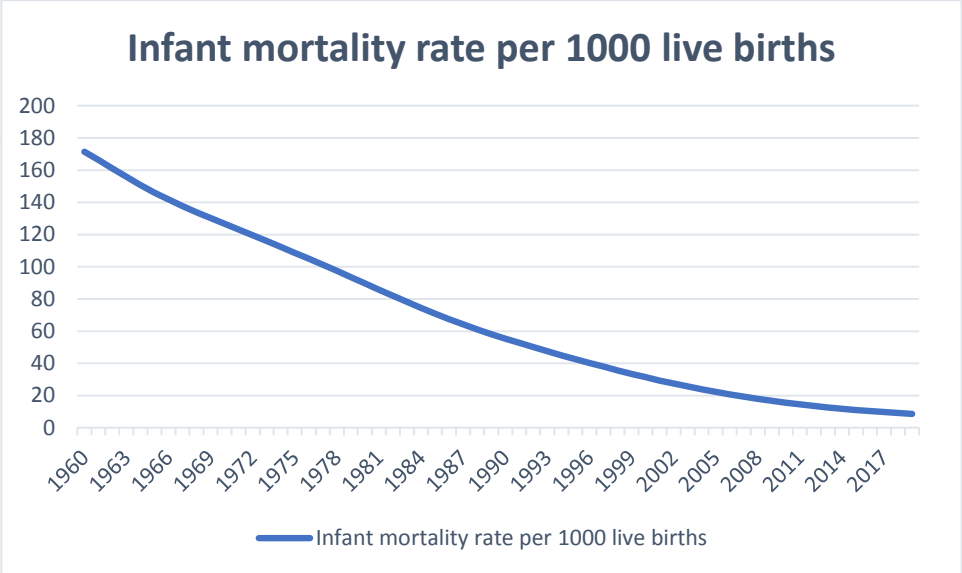


Source: OECD Database, 2020.

Figure 7: The length of hospital Stay in Turkey (1980-2018)

As shown in the figure, the length of stay at the hospital has decreased over the years. In 1980, the length of stay in the hospital was 8.5 days. Nowadays, it has decreased to 4 days. The decrease in the average days of stay at hospitals can be mainly attributed to advances in medical technology.

One of the important criteria in determining the development index of countries is health indicators. Nowadays, one way to have an idea about the development levels of countries is to examine the health indicators. Because researches show that the quality of healthcare services is better in developed countries. As countries become more industrialized and income levels rise, they allocate more health services (Ersöz F,2008). Decision-makers allocate a certain amount of budget to health services every year to achieve improvement in health indicators. The most important function of health indicators is to create standards and common measures to compare the health levels of all countries in the world. Life expectancy and infant mortality rate are indicators that the most commonly used for evaluating health systems' performance.

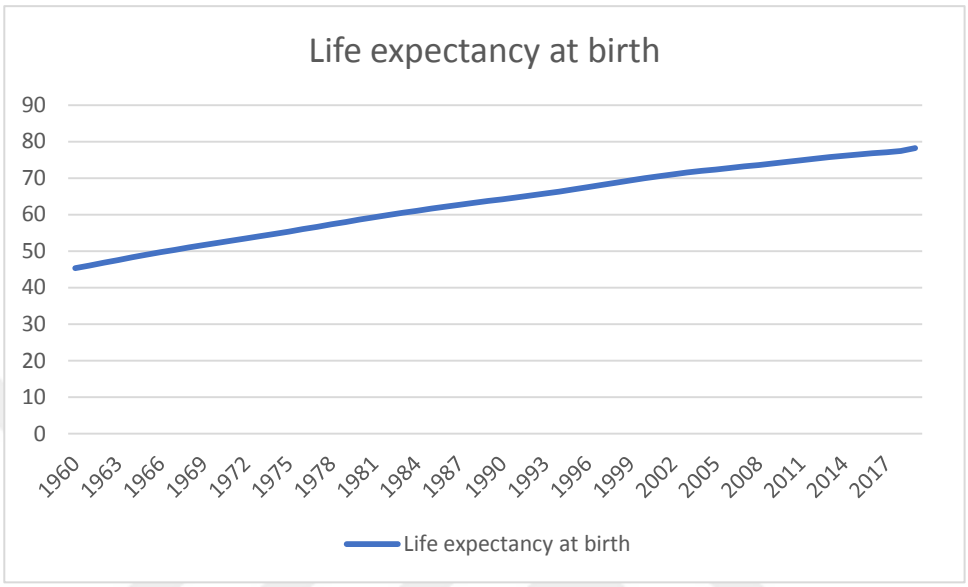


Source: TUİK, 2020.

Figure 8: Infant mortality rate per 1000 live births in Turkey (1960 – 2019)

Infant mortality is defined as deaths at the time of birth and within one year following birth. The infant mortality rate is an indicator of public health, especially child health and economic-social structure. As seen in the graph, infant mortality rates have declined substantially in the last 60 years. While the infant mortality rate per 1000 live births was 171.5 in 1960, it declined 8.6 in 2019. Although the infant mortality rate

has decreased over time in turkey, the infant mortality rate in Turkey (8,6) is above some countries such as Germany (3,2), France (3,8), Norway (2), USA (5,8), and above the OECD average (5,9).



Source: TUİK, 2020.

Figure 9: Life expectancy at birth in Turkey (1960-2019)

The life expectancy at birth is another measure that explains the health status of populations. Life expectancy relies upon an estimation of the average age that members of a given demographic group. It is one of the most widely used health status indicators. Life expectancy at birth can be attributed to a variety of factors, including rising living standards, improved lifestyle and better education, and greater access to quality health care. Generally, this indicator is presented as a total and per gender and is measured in years. Life expectancy in Turkey has improved over the years, as seen in the figure. Life expectancy at birth is 45 years in 1960, life expectancy has increased steadily in Turkey, and life expectancy at birth has risen to 78 years in 2019. Although life expectancy at birth is lower than the OECD average and many developed countries, it is seen that it has approached these countries with very good progress.

CHAPTER THREE
METHODOLOGY

3.1. The Model

Using the Solow growth model and other growth models, the following model is obtained.

The model can be written to:

$$ln\left[\frac{Y}{L}\right]_t = \varphi_0 + \varphi_1 lnL_t + \varphi_2 lnK_t + \varphi_3 lnH_t + u_t \quad (3.1)$$

A dummy variable is added to examine the 2003 health transformation policy's impact on health expenditures and economic growth. The dummy variable takes a value of 1 after the 2003 health transformation policy and 0 before that year. The model is then:

$$lnY_t = \alpha_0 + \alpha_1 lnK_t + \alpha_3 lnL_t + \alpha_4 HE_t + \alpha_5 D_t + u_t \quad (3.2)$$

Due to health expenditures are an investment in human capital, health expenditures are used to express human capital in the model. Dependent variable (*Y*) is real GDP per capita. (*K*) is a ratio of capital stock to GDP. *L* is sum of employment over population. Human capital variable (*H*) is defined as a ratio of health expenditure to reel GDP. the error term is shown as (*u*). Besides, the dummy variable has taken the value 0 until 2004 and the value 1 after 2004. The purpose of putting this dummy variable into the model is to observe the impact of the health transformation policy on economic growth in 2003.

3.2. Data

In the study, annual data obtained from the 10.0 Pennworld database of the years 1975 to 2019 is used for Turkey. All data used are included in the model by taking their natural logarithms. As the dependent variable, the real GDP per capita is taken as an indicator of economic growth. As independent variables, the ratio of capital stock to real GDP, the ratio of health expenditures to real GDP, and finally, the share of employment in the population is used. To measure the impact of this policy, a dummy variable is

added to the model. It is given a value of 0 until 2004, and a value of 1 from 2004 to 2019.

Table 3: Dataset

Variables	Explanation
ln(gdpcapita)	GDP per capita (constant 2017 TL)
ln(capitaltogdp)	Capital stock / GDP
ln(emptopop)	Employment / population
ln(healthtogdp)	health expenditure / GDP

The descriptive statistics of the variables of the model are given in Table 4.

Table 4: Descriptive Statistics

	N	Mean	Median	Maximum	Minimum	Std. Dev.
ln(gdpcapita)	45	15177.94	13652.46	26973.24	8819.76	5564.63
ln(capitaltogdp)	45	2.99	2.96	4.65	1.73	0.81
ln(emptopop)	45	0.32	0.31	0.34	0.29	0.01
ln(healthtogdp)	45	0.03	0.03	0.05	0.01	0.01

As seen in the Table 4 the number of the observation of each variable is 45. Economic growth, represented by Real GDP per capita in the table 4, is used as the dependent variable in this study. The average GDP per capita is 15 177 in Turkish Lira in Turkey. As in seen in Figure-1 which is presented in appendix, the real GDP per capita of Turkey has almost continuously increased from 1975 to 2019. While it was 8 819 Turkish Lira in 1975, it has reached 26 865 in 2019. The average value of the ratio of capital stock to GDP is 2.99. The ratio of capital stock to GDP has a maximum value of 4.65 while its minimum value is 1.73. Likewise, the average value of the ratio of health expenditures to GDP is 0.03, the maximum value is 0.05, and the minimum value is 0.01. While the average value of the ratio of employment to the population is 0.32, its maximum value is 0.34, and its minimum value is 0.29.

In the study, firstly, logarithmic transformations of the variables are calculated, then their stationarity has been investigated individually. In order to investigate stationarity, PP unit root tests are used. Johansen approach is used in order to test the cointegration relationship between the variables which are GDP per capita, capital stock to GDP, employment to population and, health expenditure to GDP. Finally, STATA 14 package program is used in all tests.

3.3. Methodology

One of the most critical issues in dealing with time series is non-stationary variables. Variables must be stationary at the level to examine the relationship between variables. If the analyzed series are not stationary at the level, the cointegration relationship between the variables is examined. In this study, to investigate the relationship between health expenditure and economic growth, stationarity tests are run to determine the stationarity of the variables as a first step. Then, to examine the relationship between variables in the model, the Johansen cointegration test is preferred.

For this reason, firstly, the stationary state of the variables and then the cointegration relationship is examined. In the next section, Phillips Perron Test, in which the unit root test is explained. That section is followed by the explanation of the Johansen cointegration test.

3.3.1. Unit Root Test (Phillips Perron Unit Root Test)

Most econometric analysis is based on time series analysis. One of the most important aspects of time series is to test whether the series subject to research has unit root. In order to obtain statistically meaningful outcomes, the stationary of the variables used must be investigated. In a case where time series are not stationary at the level, stationarity can often be obtained by taking differences in variables. Using variables which have unit roots, the results of the regression might end to be spurious. Error correction model (ECM) allows to use non-stationary variables in their level forms even they are non-stationary. On the other hand, ECM model can be used only for variables with the same order of integration.

There are some conditions for the series used in time series to be stationary. These conditions are given below (Ertek, 1973: 380):

- The series should have constant mean: $E\ (Y_t) = \mu$
- The series should have constant variance:$Var\ (Y_t) = E\ (Y_t - \mu)^2 = \sigma^2$
- The series should not have seasonality. That is to say the covariance between two periods of the same variable does only depend the delay between these variables:

$\lambda_k=E[(Y_t-\mu)*(Y_{t-k}-\mu)]$

In sum, the mean, variance and covariance of a time series must be constant. These conditions can be tested by several unit root tests. Dickey-Fuller Test presumes that error terms are statistically independent and have constant variance. When using this methodology, it is a must to be sure that there is that error terms are not correlated and their variance does not change over time. Phillips and Perron (1988) expanded this assumption regarding Dickey-Fuller's error terms. To better understand this situation, the following regression is considered:

$$Y_{t=}\,\hat{a}_0 + \hat{a}_1\; y_{t-1} + \mu_t$$

$$Y_t = \tilde{a}_0 + \tilde{a}_1 y_{t-1} + \tilde{a}_2(t - T/2) + \mu_t$$

Here T is the number of observations, $(\hat{a}_0, \hat{a}_1)$ and $(\tilde{a}_0, \tilde{a}_1, \tilde{a}_2)$ are the coefficients of the estimated equation, μ_t is the distribution of the error terms, and the expected mean of this error term is equal to zero. However, it is not necessary to assume that there is no intrinsic correlation or homogeneity between the error terms. From this point of view, independence and homogeneity assumptions of the Dickey-Fuller test are accepted as weak dependence and heterogeneous distribution of abandoned error terms in the Phillips-Perron test. Thus, Phillips-Perron did not take into account the limitations of the assumptions of error terms in developing t statistics (Enders and Walter ,1995).

Hypotheses for the most commonly used test statistics:

$Z(t\hat{a}_1): \hat{a}_1 = 1$ It is used to test the hypothesis.

$Z(t\tilde{a}_1): \tilde{a}_1 = 1$ It is used to test the hypothesis.

$Z(t\tilde{a}_2): \tilde{a}_2 = 1$ It is used to test the hypothesis.

$Z(\varphi_3): \tilde{a}_1 = 1\ and\ \tilde{a}_2 = 1$ It used to test hypotheses.

Critical values for $Z(t\hat{a}_1)$ and $Z(t\tilde{a}_1)$ are given under the titles τ_μ and τ_t in the Dickey-fuller table. The critical values for $Z(\varphi_3)$ are the same as the dickey-fuller φ_3 statistic (Enders and Walter, 1995). If the absolute value of the calculated test statistic is less than the absolute value of the table value, the basic hypothesis that the series is not stationary is accepted. If the value of the calculated test statistic is absolutely greater

than the table value, the alternative hypothesis that says the series is stationary is accepted.

In studies conducted with time series, it is an important prerequisite for the series to meet the stationarity condition to obtain statistically reliable results. In this study, before examining the relationship between health expenditure and economic growth, the PP unit root test were run. The results of the unit root analysis are given in Table 5.

Table 5: Results of Unit Root test for variables

	Phillips Perron Unit Root Test		
Variables	**(constant)**	**(constant and trend)**	**(no constant)**
ln(gdpcapita)	0.79 (0.99)	- 1.80 (0.68)	2.77 (0.99)
ln(capitaltogdp)	- 0.68 (0.84)	- 0.97 (0.93)	0.43 (0.80)
ln(emptopop)	- 1.83 (0.36)	- 1.83 (0.66)	- 0.39 0.53
ln(healthtogdp)	- 1.06 (0.72)	- 1.86 (0.65)	- 1.06 (0.25)
Δln(gdpcapita)	- 6.55* (0.00)	- 6.92* (0.00)	- 5.84* (0.00)
Δln(capitaltogdp)	- 5.50* (0.00)	- 5.57* (0.00)	- 5.45* (0.00)
Δln(emptopop)	- 5.79* (0.00)	- 5.71* (0.00)	- 5.84* (0.00)
Δln(healthtogdp)	- 6.98* (0.00)	- 7.00* (0.00)	- 6.81* (0.00)

Note: "*" Denote that we can reject the null hypothesis of non-stationarity at 5%.

According to PP unit root test results, it is found that the variables are not stationary at their level form. However, when the first differences are taken, it is seen that all of the variables became stationary at 5% level. As a result of the stationarity analysis, it is found that the order of integration of the variables are stationary at the same level I(1) Based on the results of unit root tests, it is concluded that Johansen approach is appropriate to investigate the relationship between the variables.

3.3.2. VAR Lag Order Selection Criteria

The next step is to research the long-term relationship between variables. Sufficient lag-length must be set before implementing the Johansen cointegration method. The results of the selection criterion for VAR lag order have been presented in Table 6. In order to approximate cointegration and unrestricted VAR, a Akaike information criterion was adopted.

Table 6: Results of VAR Lag Order Selection Criteria

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	105.68	NA	7.3e-08	-5.08	-5.02	-4.91
1	288.41	365.47	1.8e-11	-13.42	-13.11	-12.57
2	346.60	116.38	2.2e-12	-15.53	-14.98	-14.01*
3	370.01	46.81	1.6e-12	-15.90	-15.10	-13.70
4	404.77	69.51*	7.2e-13*	-16.83*	-15.80*	-13.96

Note: "*" indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final Prediction error, AIC: Akaike information criterion, SBIC: Schwarz information criterion, HQIC: Hannan-Quinn information criterion.

Considering the test results given in the table, it is seen that different lag lengths are detected among the criteria. Considering the Akaike information criterion (AIC), Bayesian information criterion (SBIC), and Hannan and Quinn information criterion (HQIC); According to HQIC, AIC, and other criteria, four lag-length should be used between variables, and three lag-lengths according to AIC criteria. Considering these criteria, it was decided to use four lag-lengths, which are the common results of AIC and other criteria, in the model. It has been tested whether the selected lag-length meets the stability condition, and it has been seen that each characteristic root is located in the unit circle.

3.3.3. Cointegration Analysis (Johansen Cointegration Test)

Cointegration analysis is basically a method developed to investigate the relationship between non-stationary variables. If the variables are cointegrated they will have a reliable long-run relationship and ECM model can be run to investigate both long-run and short-run relationship of these variables. However, one of the conditions to check a possible cointegration is that the variables should have the same order of integration. However, in the analysis, there are cases where the order of integration

degrees of the series is different. When it is seen that the degree of integration is different in time series, it becomes impossible to apply Engle-Granger cointegration analysis or Johansen cointegration test (Engle and Granger, 1987; Johansen and Juselius, 1990).

The Johansen test is a test that is calculated based on eigenvalues and eigenvectors. In the first stage of this test, the degrees of stability are determined as in the Engle-Granger test. For series that are stationary at the same order, the appropriate delay number is found. In order to determine the appropriate delay number, the VAR model is established first. The number of delays is decided with the Akaike and Schwarz information criteria.

The Johansen Cointegration Test uses two different statistics to assess if the time series will move together in the long run. The first is considered the 'Trace Test,' and the second is the 'Maximum Eigenvalue Test.

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} + \ln (1 - \hat{\lambda}_i)$$

$$\lambda_{max} = -T \ln(1 - \hat{\lambda}_{r+1})$$

Johansen and Juselius have developed critical values that will be applied in trace and max-eigenvalue tests (1990). The following are null and alternative hypotheses that decide whether co-integrated vectors exist:

$H_0 : r = 0$ ($No\ cointegration\ between\ the\ series$)

Alternative hypothesis for trace test : $H_1 : r \geq 1$

Alternative hypothesis for max-eigenvalue test : $H_1 : r = 1$

Johansen cointegration test results without the inclusion of dummy variables are presented in Table 7.

Table 7: Johansen Cointegration Test

Null H0	λ (Trace)	5% critical value	λ(Max)	5% critical value
r=0	55.18*	47.21	28.15*	27.07
r≤1	27.03	29.68	15.65	20.97
r≤2	11.37	15.41	10.06	14.07
r≤3	1.31	03.76	1.31	03.76

Source: Authors calculation from STATA 14 soft-ware
Notes: (1) r denotes the number of cointegration equation. (2) Optimal lag length is determined as 4 by AIC. (3) '*' denotes the rejection of the null hypothesis of unit root at %5 significance level respectively.

Johansen cointegration test results are presented in Table (6). Starting with the λ (Trace) the null hypothesis of r= 0 (no cointegration) is rejected in favor of the alternative hypothesis r = 1 for Turkey. In addition to this, the null hypotheses (r ≤ 1) cannot be rejected in favor of the alternative hypotheses (r = 2). These results show the existence of only one cointegrating relationship for Turkey. There are identical findings drawn from the results of the trace test. The null hypothesis of r = 0 is rejected in favor of r ≥ 1. Furthermore, the null hypotheses of r ≤ 1 cannot be rejected in favor of the alternative hypotheses of r ≥ 2. The max-eigen test results show the existence of only one cointegrating relationship during the subject period. The results from both of the tests suggest that there is a long-run equilibrium relationship between health expenditure and economic growth in the Turkish economy during the subject period.

3.3.4. Johansen Normalized Cointegrating Equation

Table 8: Johansen Normalized Cointegration Equation(Error Correction Model)

	Long Run Relationship			
Variable	**Coefficient**	**Standart Error**	**Z-value**	**P > |Z|**
ln(gdpcapita)	1	-	-	-
ln(capitaltogdp)	0.39	0.13	2.91	0.00
ln(emptopop)	2.09	0.33	6.31	0.00
ln(healthtogdp)	0.60	0.08	7.31	0.00
Dummy	0.34	0.09	3.45	0.00
Constant	13.44	-	-	-

Source: Authors calculation from STATA 14 soft-ware

Long run equilibrium:

ln(gdpcapita)=13.44 + 0.39 ln(capitaltogdp) + 2.09 ln(emptopop) + 0.60 ln(healthtogdp)+ 0.34 Dummy (3.3)

Here, all coefficients are significant at a 1% significance level. Regarding the considered variables, the variables' estimated coefficient signs show a positive impact on Turkey's economic growth. The coefficients of the capital stock show a positive impact on the economic growth of Turkey. According to this, when other variables are held contant, a 1% percent increase in the ratio of capital stock to real GDP is associated with a 0.39% increase in economic growth. And also, when other variables are held constant a 1% percent increase in the share of employment in the population is associated with a 2.09% increase in economic growth. Finally, when other variables are held constant a 1% percent increase in the ratio of health expenditures to real GDP is associated with a 0.60% increase in economic growth. Besides, the dummy variable also has a positive impact on economic growth. In other words, The health transformation policy in 2003 has a positive effect on economic growth.

Table 9: Johansen Normalized Cointegration Equation without dummy (Error Correction Model)

		Long Run Relationship		
Variable	**Coefficient**	**Standart Error**	**Z-value**	**P > |Z|**
ln(gdpcapita)	1	-	-	-
ln(capitaltogdp)	0.75	0.13	5.62	0.00
ln(emptopop)	2.09	0.49	4.23	0.00
ln(healthtogdp)	0.88	0.04	19.37	0.00
Constant	14.07	-	-	-

Source: Authors calculation from STATA 14 soft-ware

Long run equilibrium:

ln(gdpcapita)=14.07 + 0.75 ln(capitaltogdp) + 2.09 ln(emptopop) + 0.88 ln(healthtogdp)

(3.4)

In addition, cointegration analysis was performed without adding dummy variables. Results are shown in table-10. Accordingly, the same way about all of the variables, the estimated coefficients of the variables shows signs of a positive effect on Turkey's economic growth. Moreover, when other variables are held constant a 1%

percent increase in the ratio of capital stock to real GDP is associated with a 0.75% increase in economic growth. And also, when other variables are held constant a 1% percent increase in the share of employment in the population is associated with a 2.09% increase in economic growth. When other variables are held constant 1% percent increase in the ratio of health expenditures to real GDP is associated with a 0.88% increase in economic growth.

3.3.5. Diagnostic Test

The models were tested to determine whether they are normally distributed, have constant variance and contains serial correlation. Diagnostic test results specified that models were well specified. Diagnostic tests also indicated that the residuals are homoscedastic, and serially uncorrelated. However, Jarque- Bera normality test depicted non-normality. According to Mcdonald (2014), deviation from normality in the case of parametric tests is not very sensitive. Wooldridge (2012) pointed out that the non-normality of errors is not a serious problem with large sample size. Ghasemi and Zahediasl (2012) also suggested that with large enough sample sizes (> 30 or 40), the violation of the normality assumption should not cause major problems; this implies that we can use parametric procedures even when the data is not normally distributed.

Table10: Autocorrelation Test Results

Lagrange-multiplier Test

Lag	**Chi2**	**df**	**Prob > Chi2**
1	23.99	25	0.51
2	23.13	25	0.56
H0: no autocorrelation at lag order			

Test results to check whether there is any autocorrelation in the model are shown in Table 10. The p values shown are greater than 5%. Accordingly, the null hypotheses could not be rejected, and it was concluded that there was no autocorrelation in the model.

Table11: Normality Test Results

Jarque-Bera Testi

	Chi2	**df**	**Prob > Chi2**
VEC Model	222.71	10	0.00
H0: Residuals are normally distributed			

Test results of normality in the model are shown in Table 11. The p value shown is lower than 5%. Accordingly, the null hypotheses could be rejected, and it was concluded that the residuals were not distributed normally in the model.

Table 12: Hetereskedasticity Test Results

Joint Test:		
Chi-sq	**df**	**Prob.**
534.89	540	0.55
H0: Resuduls are Homoskedasticity.		

Test results of heteroscedasticity in the model are shown in Table 12. The p-value shown is lower than 5%. Accordingly, the null hypotheses could not be rejected, and it was concluded that the residuals are homoscedastic in the model. The error terms of the model have constant variance.

3.3.6. Error Correction Model

Error correction model technique is used in two or more time series with a long-term stochastic pattern, also known as co-integration. Error correction models provide information on the short-term and long-term impact of time series on each other. Accordingly, the error correction term's definition provides details on the long-term dynamics, while the common importance of the lagged explanatory variables decides the short-term causality. Using the information obtained from the error correction model, the user may have long and short-term analyses depending on the purpose of the research.

The ECM model is estimated in three stages. In the first stage, it should be determined whether the variables considered in the model are stationary or not. In the series that is stationary at the same level, the presence of cointegration is investigated in the second stage. In the third stage, short-term elasticities and adaptation rates can be estimated from the error correction model. If cointegration is not found between series, the standard Granger (1969) test should be applied (Kızılgöl, 2006: 9).

It was found that all the compound variables are stationary at the first difference and cointegrated in the long run; for the sake of this, the error correction model is presented as follows:

$$\Delta(\ln)\text{gdpcapita} = \beta_0 + \Sigma_{i=1}^{m}\beta_i\Delta(\ln)gdpcapita_{t-i} + \Sigma_{i=1}^{n}\alpha_i\Delta(ln)capitaltogdp_{t-i} + \Sigma_{i=1}^{p}\gamma_i\,\Delta(ln)emptopop_{t-i} + \Sigma_{i=1}^{r}\delta_i\Delta(ln)healthtogdp_{t-i} + \Sigma_{i=1}^{s}\omega_i\Delta dummy_{t-i} + \phi_1 ECM_{t-1} + u_{1t} \quad (3.5)$$

Here, ϕ denotes speed of adjustment parameter with a negative sign. "Δ" is the first order difference operator of the variable. "i" is the number of lags. (ln)gdpcapita, (ln)capitaltogdp, (ln)emptopop and (ln)healthtogdp show short-term dynamics, and the coefficients before them reflect short-term relationships.

ECM refers to the error correction term. The error correction term is the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the independent variables which contains long-run information coming from the long run cointegrating relationship. Finally, the time "t", "μ_{1t}"; shows the non-autocorrelated error terms.

ECM analysis shows whether the dependent variable and the system formed by the independent variables have reached an equilibrium in the long term and the relationship between them in the short run. Looking at the results, showing the long-term relationship in terms of error correction system discussed for Turkey ECM coefficient as expected negative and statistically significant at the 5% level. Here, ECT is a parameter that specifies the rate of adjustment to the equilibrium level after a shock. It should have a statistically significant coefficient with a negative sign. Here, ETC has a value of -0.27. This means that in case of a shock in the system, the dependent variable, GDP, will adjust by 0.27 percent after one period for each short term (one period here is equivalent to one year as the data is annual). In other words, it reaches equilibrium in the long term by adjusting itself in about four years. On the other hand, for several variables, LD, L2D, and L3D are short-term coefficients. When we consider the short-term relations, neither the coefficient of the ratio of employment to the

population nor the coefficient of the dummy variable is significant in the short run. Among the variables considered, only the coefficient of the second lag of the share of health expenditures in GDP and the second lag of the capital stock was found to be significant and positive. An increase in health expenditures and capital stock will have a positive effect on growth. Error correction model results are given in the table 13 below.

Table 13: Error Correction Model

	Short Run Relationship			
Variable	**Coefficient**	**Standard Error**	**Z-value**	**P>|Z|**
_ce1 L1	-0.27	0.12	-2.10	0.03**
Δ ln(gdpcapita)				
LD	-0.07	0.20	0.36	0.72
L2D	0.24	0.17	-1.38	0.16
L3D	0.11	0.16	-0.71	0.47
Δ ln(capitaltogdp)				
LD	-0.16	0.15	1.09	0.27
L2D	0.24	0.14	-1.74	0.08*
L3D	0.02	0.15	-0.17	0.86
Δ ln(emptopop)				
LD	-0.56	0.43	1.30	0.19
L2D	-0.39	0.40	0.96	0.33
L3D	0.23	0.42	-0.55	0.58
Δ ln(healthtogdp)				
LD	0.05	0.08	-0.58	0.56
L2D	0.20	0.08	-2.39	0.01***
L3D	0.11	0.08	-1.29	0.19
Δdummy				
LD	0.02	0.07	-0.40	0.69
L2D	-0.09	0.05	1.64	0.10
L3D	0.00	0.06	-0.15	0.88
Cons	0.02	0.01	2.11	0.03**

Source: Authors calculation from STATA 14 soft-ware

Note1: LD, L2D and L3D denotes one-lag, two-lag and three-lag values of the relevant variable, respectively.

Note2: *, ** and *** indicate significance at the 10%, 5% and 1% level respectively.

CONCLUSION

Being healthy and living healthy is one of the most fundamental rights and indispensable desires of people. The disease has many negative effects not only on the patient but also on his family and society. It is known that healthy people learn better, improve their skills, and increase their welfare with higher income by increasing their productivity. Hence, the survival and development of human beings undoubtedly relies on the advance of healthy generations and their economic prosperity. In other words, health expenditures, which can be defined as all expenditures made to protect, not only develop and maintain people's health, increase the health level of the individual and the society but also affect economic growth by contributing to human capital. A healthy society means a qualified human resources and is of great importance for economic growth.

In order to observe the relationship between the variables for Turkey during 1975-2019, this study constructed a multivariate framework using the variables GDP per capita, capital stock to GDP, employment to the population and, health expenditure to GDP. Time-series techniques such as PhillipsPerron (PP) unit root tests, Johansen cointegration test, error correction model (ECM) were employed. The study also conducts diagnostic tests for normality, heteroskedasticity, autocorrelation.

The estimated results suggested that there is one cointegration for Turkey. To analyze the long-run relationship, the study has employed Johansen cointegration procedure. The results of both trace and max eigenvalue tests indicated that there is one cointegration, and then there is a long-run equilibrium relationship among variables, namely, ln(gdpcapita), ln(capitaltogdp), ln(emptogdp) and, ln(healthtogdp). Therefore, the results of both tests proved the existence of a long-run relationship in the selected country.

The normalized equation shows that all coefficients are significant at a 1% significance level. In the long run, capital stock positively affects GDP per capita in Turkey. According to this, a 1% percent increase in the ratio of capital stock to real GDP is associated with a 0.39% increase in economic growth. The ratio of employment to population also positively affects GDP per capita in Turkey. A 1% percent increase in the share of employment in the population is associated with a 2.09% increase in

economic growth. Finally, a 1% percent increase in the ratio of health expenditures to real GDP is associated with a 0.60% increase in economic growth. Besides, the Dummy variable has a positive effect on GDP per capita. Here the dummy variable has taken the value 0 until 2004 and the value 1 after 2004. Considering the results, the 2003 health transformation program has a positive effect on economic growth. The result shows that the coefficient of error correction term (ECT) for gdcapita equation was significant for Turkey, which indicates that there are significant adjustments towards long-run equilibrium in any disequilibrium situation. When we look at the short-term relationships, the ratio of employment to the population and the coefficient of the dummy variable are not significant in the short run. Among the variables considered, only the second lag coefficient of the share of health expenditures in GDP and the second lag coefficient of the capital stock was found to be significant and positive. In the short term, an increase in health expenditures and capital stock will have a positive effect on growth.

As seen from the results, the realization of expenditures that aim to increase efficiency and productivity in the field of health will have a positive impact on a country's human capital. As a result of this spending, economic growth and development might accelerate, and the level of social welfare will increase. The results of the study clearly highlight the importance of health expenditure in Turkey. In the long term, health spending is positive associated with GDP per capita in Turkey. Therefore, Turkey should continue to increase its health spending and improving the health sector. There is also a positive relationship between GDP per capita and 2003 health transformation program implementations. And it supports the economic growth of Turkey.

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