Hacettepe University Graduate School of Social Sciences

Department of Economics

Ph.D.

THE RELATIONSHIP BETWEEN PHARMACEUTICAL EXPENDITURES AND ECONOMIC GROWTH FROM THE HUMAN CAPITAL PERSPECTIVE

Ümit ASLAN

Ph.D. Dissertation

Ankara, 2019

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ACCEPTANCE AND APPROVAL

The jury finds that Ümit Aslan has on the date of 26/07/2019 successfully passed the defense examination and approves his/her Ph.D. Thesis titled “The Relationship between Pharmaceutical Expenditures and Economic Growth from the Human Capital Perspective”.

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26/07/2019

Ümit ASLAN

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ETİK BEYAN

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ABSTRACT

ASLAN, Ümit. *The Relationship between Pharmaceutical Expenditures and Economic Growth from the Human Capital Perspective*, Ankara, 2019.

The growth theory focuses on human capital as a determinant of economic progress since the second half of the 20th century. In this study, human capital and its health and education components are examined. The aim of the study is to evaluate the relationship between human capital and education and health also the effect of human capital on growth. In this context, schooling rates for education and pharmaceutical expenditures, which may be the biggest financial measure for the concept of health, are emphasized in general. In the literature, studies on the relationship between human capital and education are predominant. In this study, the emphasis is placed on the health component of human capital and health related pharmaceutical expenditures. The study differs from the majority of studies in the literature considering these goals and objectives. The fact that pharmaceutical expenditures are an important element of health expenditures and the relationship between health expenditures and economic growth under the scope of human capital, as set forth in the studies, may lead to an expectation that the expenditure on pharmaceuticals will affect economic growth in the same direction as health expenditures. The relationship between pharmaceutical expenditure that consists of pharmaceutical prices, qualitative or quantity of pharmaceuticals and quantitative consumption amount and economic growth is examined in this context. As a result of the detailed regression analysis using panel data, this study concludes that pharmaceutical expenditures do not affect economic growth in positive direction. Within the same model, it is concluded that capital stock, foreign direct investments, school enrollment rate and unemployment rate affect economic growth.

Keywords

Human Capital, Pharmaceutical Expenditures, Growth, Panel Data Analysis.

ÖZET

ASLAN, Ümit. *Beşeri Sermaye Perspektifinden İlaç Harcamaları ve Ekonomik Büyüme Arasındaki İlişki*, Doktora Tezi, Ankara, 2019.

Büyüme teorisi 20. yüzyılın ikinci yarısından itibaren ekonomik ilerlemenin bir belirleyicisi olarak beşeri sermaye üzerinde odaklanmaktadır. Çalışmada, beşeri sermaye ve onun sağlık ve eğitim unsurları ele alınarak incelenmektedir. Beşeri sermaye ile eğitim ve sağlık arasındaki ilişkisinin ve beşeri sermayenin büyüme üzerine etkisinin değerlendirilmesi çalışmanın amaç ve hedeflerini oluşturmaktadır. Bu çerçevede genel olarak eğitim için okullaşma oranları, sağlık kavramı için en büyük maddi ölçümü olabilecek ilaç harcamaları üzerinde durulmaktadır. Literatürde beşeri sermaye ve eğitim ilişkisine yönelik çalışmalar ağırlıklıdır. Bu çalışmada, beşeri sermayesinin sağlık bileşenine ve sağlıkla ilgili ilaç harcamalarına vurgu yapılmıştır. Çalışma bu amaç ve hedefleri ile literatürde bulunan çalışmaların büyük bir kısmından farklılık göstermektedir. İlaç harcamalarının sağlık harcamalarının önemli bir unsuru olması ve yapılan çalışmalarda ortaya konulduğu gibi sağlık harcamalarının ise beşeri sermaye kapsamında ekonomik büyüme ile olan ilişkisi, ilaç harcamalarının da sağlık harcamaları ile aynı yönde ekonomik büyümeyi etkilemesi düşüncesini doğurmaktadır. İlaç fiyatları, niteliksel veya niceliksel tüketim miktarı ile oluşan ilaç harcamaları ve ekonomik büyüme arasındaki ilişki bu kapsamda incelenmektedir. Panel veri analizi kullanılarak yapılan ayrıntılı regresyon analizi sonucunda ilaç harcamalarının ekonomik büyümeyi olumlu etkilemediği sonucuna ulaşılmaktadır. Aynı yöntemle sermaye stokunun, doğrudan yabancı yatırımların, okul kayıt oranının ve işsizlik oranının ise ekonomik büyümeyi etkilediği sonucuna ulaşılmaktadır.

Anahtar Sözcükler

Beşeri Sermaye, İlaç Harcamaları, Ekonomik Büyüme, Panel Veri Analizi.

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INTRODUCTION

Physical and human capital, labor and land are the main factors affecting economic growth. This thesis focuses on the effect of human capital on economic growth. In this context, education and health elements that contribute to human capital are emphasized. In particular, expenditures in the field of health significantly reflect the contribution to health in the field of human capital.

The major part of health expenditures is medicine and treatment expenditures. Pharmaceutical expenditures are investigated in detail in relation to the growth of human capital.

The pharmaceutical sector, which is one of the most important components of the health sector, is considered a subgroup of the chemical industry. The pharmaceutical sector is different from other sectors because it is relevant to the health feature of population.

This study aims to reveal the relations between economic growth and human capital in detail together with supporting issues such as pharmaceutical expenditures and schooling. The contribution will be provided to eliminate problem of pharmaceuticals not being covered in scope of the license or reimbursement system due to firms' false spending policies. In addition, contribution will be provided to eliminate problem of ineffective use of public funds as a result of the misspending. Ultimate goal and contribution will be to improve the health of patients whose access to pharmaceuticals is restricted due to misspending and pricing, deficiencies in licensing and reimbursement problems. These considerations also related to overall economic well-being.

The phenomenon of health needs to be well understood in order to elucidate the relationship between health and economic growth. Health is important not only in the absence of the disease, but also in the context of the skills that will

develop individuals' own potentials. In this framework, health is an asset of individuals and helps to increase their welfare. On the other hand, health can affect economic growth through different channels. For example; reducing production losses due to health workforce disturbances, and absenteeism among school children, and advancing mental learning. In addition, health permits the use of natural resources that are partially or completely unavailable due to illness. Finally, health allows the use of financial resources allocated for the treatment in more effective ways.

In summary, health can directly affect economic growth due to increased labor productivity, human capital and less economic burden.

It was stated that the people all around the world were taking health at the top of the list of their demands. The shortage of disease and premature deaths has transformed the health factor as the primary concern of all societies, and therefore health was also included among the fundamental human rights in international law. Almost every culture accepts the principle that “health is wealth”.

It is thought that pharmaceutical expenditures should be positively related to economic growth considering that the expenditures of the pharmaceutical are positively associated with the health expenditures. This relationship is investigated empirically in this study. Since the studies on the relationship between pharmaceutical expenditures and economic growth are not included in the literature, it is thought that this study will contribute to the literature.

In this context, the human capital theory is examined in the first part of the study. Exogenous and endogenous growth models including human capital are examined. Lucas and Schumpeterian approaches are mentioned. In addition, the information is given about models related to human capital. On the other hand, the components of human capital are explained in detail in the context of

empirical analysis of the study. The study of the productivity and returns of human capital is also included in this section.

In the second part, the issue of economic growth is investigated in the scope of the empirical analysis of the relationship between pharmaceutical expenditures and economic growth. Studies on the measurement of economic growth and indicators of economic development are presented. Therefore, gross domestic product, gross national product, purchasing power parity, life index and human development index, income distribution, human capital, education, health, population, savings and investment issues, sectoral structure and urbanization rate are covered in this section.

The pharmaceutical sector is examined in the third part of the study. Considerations in literature regarding direct price controls, profit controls, parallel trade, compulsory licensing, agreement and reference pricing and its effects are presented. On the other hand, legal arrangements are also scrutinized in the formation of pharmaceutical prices and the pricing process. Licensing which is decisive in pharmaceutical pricing, cost sharing and equivalent price practices are also explained.

In the fourth part of the study, the relationship between pharmaceutical expenditure and economic growth is analyzed empirically in context of human capital theory. Panel data analysis is used for analysis. In this section, the variables and data used in the empirical analysis are discussed. The results of the empirical study and the results of the relationship between pharmaceutical expenditures with other independent variables and economic growth are also included.

In the conclusion part of the study, the findings of the thesis especially the relationship between pharmaceutical expenditure and economic growth, is presented.

CHAPTER 1

HUMAN CAPITAL THEORY

In this section, the contribution of human capital to economic growth is examined in the theoretical framework. In the following sections, an empirical analysis of this relationship is done. In theory, there are exogenous and endogenous growth models. In exogenous growth models, technological progress is excluded from the economic system. The endogenous growth models in which technological progress takes place within the economic system can be categorized under two approaches, the Lucas and Schumpeterian approach.

In the neoclassical growth theory, ability of growth of society changes due to capital accumulation. Capital can also be intangible. It stems from human resources, a mixture of capital and labor. This capital is defined as human capital.

The history of human capital dates back to ancient times. Human capital is a concept developed in order to indicate how education and health affect wages, productivity or skills of labor. As the economic literature progressed, the productivity of individuals and their importance in economic activities have been discovered and defined as human capital (Karataş and Deviren, 2005: 72). Human capital is considered as features such as knowledge, skills, experience and dynamism that emphasize the quality of the individual participating in production (Karagül, 2003: 81).

The view that human factor is a capital element started to gain a theoretical integrity only after World War II. Schultz, Becker, Denison, Mincer were the economists who introduced a systematic integrity to human capital in the 1960s in parallel with the developments that emerged after the World War II. Human

Capital Theory has taken its place in neoclassical economics with the contribution of these economists. Thus, human capital is regarded as important as physical capital stock for the economic growth.

The first contribution to the theory of human capital came from T.W. Schultz (1961). Schultz expressed that capital can be not only homogeneous but also heterogeneous, similar to classics argument. Schultz emphasized that it would be insufficient to explain the increase in productivity with physical capital completely, and that the increase in productivity was hidden in the skills acquired by various factors. Thus, investment in people is important. Schultz categorized investment for the human under in five groups (Schultz, 1966: 414).

1. Formal education.
2. All training programs in the workplace and in companies.
3. Non-formal training programs carried out outside companies.
4. Health services that affect human life and work force.
5. Migrations that provide better job opportunities.

Empirical studies show that labor and capital input is smaller than output growth in the US (Mincer 1981). This unexplained growth is called the Solow residual. Sometimes this is interpreted as the contribution of technological progress. However, since it is not known which factor contributes to technological progress, the Solow model is known as an exogenous growth model. Thus, for additional determinants of growth, Romer (1986, 1990), Lucas (1988), Barro (1991, 1999) and Aghion and Howitt (1992) have developed endogenous growth theories. According to endogenous growth theories, the increase in human capital affects the growth in output; therefore human capital is accepted as one of the determinants of economic growth.

1.1. THE RELATIONSHIP BETWEEN ECONOMIC GROWTH AND HUMAN CAPITAL

The contribution of education and health within the scope of human capital will raise the knowledge and productivity of the individual and, thus lead to an increase in the level of output, provided that tangible inputs are the amount of same or if possible lesser.

In the exogenous growth theory, it is assumed that human capital will cause an increase in production (Mankiw et.al., 1992). On the other hand in endogenous growth theories in which technological progress is considered endogenous, human capital affects productivity and growth. (Nelson and Phelps, 1966; Romer, 1986; Lucas, 1988).

If human capital is considered to directly affect production, it leads to an increase in production level, and if human capital increases production by affecting technological development, it leads to an increase in productivity. (Romer, 1990, Aghion and Howitt 1992; 1998).

1.1.1. Human Capital and Exogenous Growth Model

The basis of the neoclassical growth model is based on Solow's (1956) study. The production function is written as Yt=F(Kt, Lt, At). Without technological progress, growth in this model decreases due to the assumption of diminishing marginal returns. However, this model is formulated to allow the increases in productivity to offset the diminishing returns of capital.

The merger of the Solow model with human capital occurred in Mankiw, Romer and Weil (MRW) (1992). The MRW model is essentially an exogenous growth model in which human capital is added. This model expands the Solow model by adding human capital. This model can be called augmented Solow model. Because technological progress is excluded from the model, the model is called

exogenous. In the MRW model, human capital is independent and the Cobb-Douglas model is represented by the production model.

The important difference of between the MRW model and the Solow model is that it deals with the effect of the change in saving rates. The increase in saving rate leads to an increase in the equilibrium income level (steady state) and the accumulation of human capital even if there is no investment in human capital.

In the augmented Solow model, human capital is treated as an input. It affects growth level in the same way as physical capital. Similar to physical capital, human capital is also affected by the technological development.

1.1.2. Human Capital and Endogenous Growth Model

In Romer (1986, 1990), Lucas (1988), Barro (1991, 1999) and Aghion and Howitt (1992) models, technological progress stem from the accumulation or stock of human capital these models can be defined as endogenous. Two main approaches can be mentioned taking into account the effect of human capital on growth model. These are the Lucas and Schumpeterian approaches.

1.1.2.1. Lucas Approach

This model is based on “learning by doing”. Lucas (1988) adds human capital (h) to the growth model and accepts technological progress endogenous. However, human capital, which is decisive in technological progress, is considered exogenous. This feature distinguishes Lucas approach from other the endogenous models. It accepts education effect on human capital and the contained form of education is shown in the following equation.

$$\boldsymbol{Y=AK^{\alpha}(Luh)^{1-\alpha}}$$

Y, A, K and L are output, technology, capital and labor. u is the time allocated to work and h represents the human capital. (1-u) represents the surplus timeout

of work. Therefore, human capital is h = δh (1-u). In this model, the effect of human capital depends on the value of (1- u). This model also affects growth and productivity through education and schooling rate. In the Lucas model, unlike the MRW model, the time allocated does not affect part of their income and savings, but human capital. The decrease in the human capital is ignored in the Lucas model. Another difference is that human capital is predominantly based on educated people. (Barro, 1995, p.200).

The other factor distinguishes the Lucas model from other endogenous models is that the accumulation of human capital affects growth, and the level or stock of human capital is not effective.

1.1.2.2. Schumpeterian Approach

Another version of innovation-based growth theory is “Schumpeterian theory” which is described by Segerstrom et al. (1990), Aghion and Howitt (1990), Grossman and Helpman (1991) (Durlauf and Blume, 2008: 837). Schumpeter (1942) describes the process of creative destruction as the opening of new markets by companies replacing old products or production methods with a new product or production method. Schumpeter states that a dynamic process should be focused, not static (Lemanowicz, 2015: 66).

A version of the innovation-based Schumpeterian theory was initiated by Romer (1990), who assumes that total productivity is an increasing function of the product diversity level. In this theory, it is stated that innovation will increase productivity by adding new but improved values to products. In other words, productivity increase is not only with innovation; is also possible with relatively more advanced innovations; R&D Innovation (Lundvall, 2007: 10).

According to Schumpeter, factors such as innovation, creative destruction and technological competition affect economic growth. Schumpeter thinks that

technological innovation is one of the main determinants of economic growth (Schumpeter, 1939: 83-84). Technological development, innovation and inventions improve the quality of capital goods, product quality, and the general development of modern entrepreneurship. This recovery process affects the price of a good, whether it has additional costs or not. In other words, innovation and technological development eliminate the rigidity of prices. This feature necessitates entrepreneurs and firms to keep their R & D activities within the company in order to survive (Schumpeter 2014: 114-115). Schumpeter states that it will stimulate production and consumption, which in turn can shrink, enlarge or completely destroy markets with the emergence of innovation demand for firms and consumers in the capitalist economy. Schumpeter called the collapse and destruction of markets “creative destruction” and the development of the market called “creative accumulation”. According to Schumpeter, the carrier of development is not an inventor but an entrepreneur. Unless the inventor's invention is used as an innovation in markets or sectors, it is not possible to be one of the determinants of growth. It is possible for the invention to make sense by an innovation. Therefore, the meaning of the invention is realized through innovators who can transform the invention into innovations rather than inventors. Individuals expressed as innovators are entrepreneurs. In short, rather than inventions, entrepreneurs assume the role of the engine that enables mobility in the economy (Schumpeter, 1947: 152-153). To sum up, Schumpeter emphasizes that capitalism is constructed on innovations and profit, and the return of these innovations. Companies are constantly in competition with each other in order to gain monopolistic high profits. If this process continues, technological development and economic growth will take place.

Within the endogenous growth models, Rebelo (1991) shows that the simplest way of sustaining per capita growth in the long term, even in the absence of technological development. This structure, known as the AK model, was also adopted by Romer (1986) and Lucas (1988). It is assumed that there is a linear ($Y = AK$) relationship between the capital factor and the output of the economy.

A general feature of the model is the comprehensive consideration of the capital factor indicated by K. In other words, there is a human capital factor in the capital stock. Schumpeterian growth theory goes beyond AK by distinguishing explicitly.

1.2. HUMAN CAPITAL MODELS

The concept of human capital which is ignored in the classical economic theory is included in the neoclassical economic theory. Behind the lack of importance of this concept in classical theory is the adoption of the view that human capital investment is not important for economic growth. The basis of the neoclassical growth model is based on Solow's (1956) study. Neoclassical models can be analyzed in the following.

1.2.1. The Schultz Model (1961)

The foundations of human capital theory were laid by Theodore W. Schultz in 1961. Schultz stated that the US economic growth cannot be explained only by the increase in physical capital. The reason for this is that income grows faster than resources.

Schultz uses the production function derived from the assumption that production is determined by labor and capital factors based on the assumptions of neoclassical economics. The function is:

$$Y = f(K, L)$$

Y, K and L refer to production, capital, and labor. In order to examine the increase in production level, the shares of labor and capital in production are found by taking the time differentiated. By dividing the both sides of the equation by (Y), the growth rate is found.

$$\frac{\mathbf{1}}{\boldsymbol{Y}}\frac{\boldsymbol{dy}}{\boldsymbol{dt}} = \frac{\mathrm{dk}}{\boldsymbol{dt}}\frac{\boldsymbol{fK}}{\boldsymbol{Y}} + \frac{\boldsymbol{dl}}{\boldsymbol{dt}}\frac{\boldsymbol{fL}}{\boldsymbol{Y}}$$

The left side of the equation represents the increase in production and is shown as g_y. If the right side of the equation is multiplied by L and divided by L, the investment ratio *dk/ dl = I is found. fK* represents marginal output of capital, *1/ Ldl / dt =*g_L represents the growth rate of labor, $f_L/Y = s_L$ represents the share of labor in total production, and I */Y = k* represents investment output ratio. Growth rate is found by;

$$\boldsymbol{g_y = \frac{I}{Y} fK + g_L s_L}$$

If the capital is written as physical capital (K_m) and human capital (K_h) in the equation, the equation is as follows.

$$\boldsymbol{g_y = \frac{lm}{Y} rm + \frac{lh}{Y} rh + g_L s_L}$$

According to equality, the contribution of education to growth is expressed as the education-output ratio (*lh/Y*) multiplied by the social return rate of capital (*rh*). The contribution of education to growth is included in the equation in the form of primary, secondary and higher education. The expression of the contribution of education to growth is referred as “Schultz type growth” (Schultz, 1971: 59).

1.2.2. The Denison Model (1962)

Edward F. Denison examined the relationship between education and growth in order to find the sources of growth in the US economy. The Denison function using the Cobb-Douglas production function is as follows (Denison, 1962: 240-243):

$$Y = AL^{\alpha}K^{\beta}$$

Y is production; L is labor, K is capital. α and β give the shares of labor and capital in production. A is the residual factor. The residual factor is the portion of production that cannot be explained by the increases in labor and capital. This production function is expressed in terms of growth rates of factors as follows.

$$g_y = A + \alpha g_L + \beta g_K \quad (\alpha + \beta) = 1$$

1.2.3. The Becker Model (1964)

Gary S. Becker tried to explain the differences in returns with human capital. The decision of the individual about education is just like the decision of the entrepreneur in the market before starting the investment. The individual will compare his / her return and costs with continuing education. The present cost and future return of the investment is the main consideration that an individual will consider in the decision-making process.

Becker (1975: 16) observed the following relationships between human capital investment and return:

• Yield or gain is a variable with decreasing rate.
• Unemployment rate tends to be inversely related to talents.
• Young people change jobs more often than the elderly and participate more in vocational training. Schooling rates are also higher.
• Familial structure is more common in enterprises than in the EMUs.
• Talented individuals take more education.
• The division of labor is related to the size of the labor market.

$$\sum_{t=1}^{T-E} \frac{W_E - W_{E-1}}{(1+i)^t} W_{E-1} + C_E$$

The left side of the equation shows the yield that education can bring out and the right side shows the cost of education. In equality, W_E represents the present value of education and W_{E-1} is the return that can be achieved at the previous level of education. T - E refers to the individual's time allocated for education in working life, C_E is the direct costs and i is the market interest rate.

1.2.4. The Mincer Model (1970)

Jacop Mincer is another economist who tries to analyze how much income inequalities are explained by the human capital difference according to the income distribution theory. Mincer examined the contribution of school education and work experience in determining the present value of life income. The basic assumptions of the model are as follows (Mincer, 1958: 284):

According to this model, additional one-year training will lead to the same reduction in earnings. Individuals with different levels of education have to equalize their educational costs to the present value of their life income. Under the assumption that earnings do not change during working life, income differences will be compared based on differences in education costs. Training costs are composed of alternative costs of abandoned earnings since both the costs spent for training tools and equipment during the training and the earnings to be obtained during the training are postponed.

$$\ln \mathrm{E}_t = \ln E_0 + rs\sum_{i=o}^{s-1} k_i + rp\sum_{j=o}^{t-1} k_j$$

In the equation, , $E_t$represents the earning capacity in the period t. i represents the period of study, j is the years of after-school experience, k_i is the rate of investment by the school year, k_j is the rate of investment during the post-school period, *rs* is the rate of return to school, *rp* is the rate of return after-school investment.

1.2.5. Psacharopoulos Model (1973)

George Psacharopoulos tried to explain the differences in the return on human capital by making an international comparison. In this analysis, he sought answers to the following questions (Psacharopoulos, 1973: 3–4):

What is the profitability and return of education as a factor of human capital? How is the relationship between the private and social profitability of education developing and how does it explain the differences in human capital across countries? In which country is education more likely to contribute to economic growth and which level of education is more profitable? Can differences in educational return explain the causes of brain drain? His model can be shown in the following equation.

$$\sum_{t=-3}^{0}(C_h + W_s)_t(1+r)^{-t} = \sum_{t=1}^{43}(W_h - W_s)_t(1+r)^{-t}$$

C_h refers to direct costs (tuition costs), W_h refers to fees charged by higher education graduates, W_s indicates fees charged to secondary education graduates.

Educational investments gain importance in determining the level of economic growth. Development differences in rich and poor countries can be explained by human capital rather than physical capital.

1.2.6. The Lucas Model (1988)

Lucas (1988) emphasized that the effect of human capital is higher than physical capital and he revealed an endogenous growth model based on human capital.

In endogenous growth theories, technology is endogenized while explaining long-term economic growth. In this theory, it is stated that capital will have increased returns due to positive externalities, externalities created by learning, advantages provided by learning, advantages of new technological developments contrary to what neoclassic argue.

Human capital will realize long-term sustainable economic growth and development through the production of new knowledge, technological advancement and productivity growth. In short, human capital is considered as the main determinant of growth in these models.

1.2.7. Mankiw-Romer-Weil (MRW) Model (1992)

Mankiw, Romer, and Weil (1992: 416) extended Solow (1956) model with human capital and showed that human capital is at least as important as physical capital for growth. According to MRW's studies involving 98 countries for the period 1960-1985, the expansion of Solow's model with the addition of human capital causes the direct contribution of human capital to growth, and the effect of capital stock to be higher than Solow pointed out. Furthermore, in the MRW model, it is shown that the critique of the endogenous growth models and the convergence hypothesis are actually valid but this process will take a long time due to the different size of human capital accumulations of the countries.

Mankiw, Romer, and Weil (1992) considered only the education factor in the context of human capital investments. In the models that define the human capital accumulation rate as a percentage of the labor force of high school graduates, they concluded that this variable was statistically significant. Moreover, their regression results indicate that savings volume, increase in education level and population are important variables explaining the difference in per capita income between countries.

The most important of the results of MRW is that economies with lower income than their per capita income in their full employment (potential level) will have larger growth rates.

1.2.8. Benhabib-Spiegel (BS) Model (1994)

BS (1994) model is based on the relationship between human capital and total factor productivity (TFP). TFP is an indicator of economic growth and is one of the leading indicators for foreign trade and export performances (Wolf, 1997: 7).

In the BS model, it is argued that there is a positive relationship between human capital accumulation and TFP and that economic growth occurs in this direction. The basic assumption is that technological development and capture processes are influenced by the human capital ratio and all of these have a positive role in economic growth.

According to BS, the growth rate of countries with large human capital accumulation will be larger because the country which has a lot of human capital accumulation attracts other countries towards to itself by expanding its technological know-how and enables the growth of all countries' economies.

1.2.9. Jones Model (1995)

Jones analyzed human capital by analyzing it. Jones discusses technology transfer in the Nelson-Phelps (1966) model, Romer's (1990) human capital, which explains the imperfect competition markets that develop technologies, and MRW's (1992) international growth differences.

Jones emphasizes that the explanatory portion of growth will expand and better explain the role of human capital in development with these combined models. The model makes the assumption that 3 goods are produced in the economy.

These are consumer goods (output), human capital goods (skills, experience) and new intermediate capital goods (knowledge).

The empirical results of Jones analysis are as follows;

• Information is unrivaled and there is an increased return to scale. Information is produced and disseminated as a result of technological advances, thus leading to transnational technology transfers. In this way, unlimited economic growth is realized. Therefore, the increase in human capital is also unlimited.

• When the number of countries in the sample set is kept wide, physical capital investments, human capital investment rate, population growth rate explain a significant part of the GDP change.

1.3. COMPONENTS OF HUMAN CAPITAL

Human capital can be increased by consumption for the individual. Productive consumption increases the productivity of labor and simultaneously meets the needs of the individual (Steger, 2000, p. 367). J. S. Mill divides productive consumption into three groups: education, health and nutrition. These consumptions increase the productivity of labor, especially in low-income countries (Mincer, 1974). The aforementioned models mainly focus on education.

1.3.1. Education

Lau, Jamison and Loat make some observations on the contribution of human capital to the individual.

> “Education enhances the ability of an individual to perform standard tasks and to learn new tasks, the ability of an individual to process new information, education enhances the ability of individuals to

> communicate and coordinate activities, enhances the ability of an individual to evaluate and adjust to changed circumstances, enhances to reduce subjective uncertainty and unnecessary anxiety as well as fatalistic acceptance of the status quo and thereby enhances the probability of adoption of new technologies or practices by an individual. Finally, education also helps about innovations in the production technology (Lau, Jamison and Loat, 1991, p. 2)."

The results of empirical studies on the contribution of education to human capital and growth are controversial in the literature. The impact of education and schooling varies according to the level of income and development of countries. Pritchett (1999) argued that the impact of education and schooling in less developed countries is less due to lack of quality labor or the quality of education. Lazaer (1977) found that education is productive. For these reasons, education is considered as an independent variable in the empirical study to be conducted in the next part of the thesis. And the impact of education is being investigated.

> "Studies show that human capital stands out as the most important production factor among the sources of growth. Studies on human capital and economic growth [Nelson and Phelps (1966), Welch (1970), Lucas (1988), Romer (1989), Azariadis and Drazen (1990)] focus on education. These studies show that investment in education contributes to economic growth through two channels. The first is that the accumulation of human capital is a productive factor and thus leads to direct economic growth, which is called the level effect. The second is that human capital provides technological progress and indirectly leads to economic growth with increased productivity, which is called the rate effect (Freire-Serén, 2001)."

Endogenous growth theories suggest that there is an inherent technological progress that occurs when trying to maximize profits and benefits of economic units (Romer, 1994: 3; Yardimci, 2006: 32). In these theories, technology is endogenized as the source of increasing productivity in production and the factors that provide technological progress are highlighted as determinants of long-term growth. In endogenous growth theories, It is emphasized that the increasing of human capital (Lucas, 1998), social capital (Fukuyama, 1995, 2000 and 2001), R & D activities (Romer, 1986; 1990), public spending policy

(Barro, 1990), outward and foreign trade policy (Rivera-Batiz and Romer, 1991), the development of financial markets (Pagano, 1993) will contribute to long-term economic growth and thus development.

1.3.2. Health

Another important component of the concept of human capital is health. Investments in health, expenditures on health, progress in health and all factors affecting the health of individuals are included in the concept of health within the scope of human capital.

The simplest measurability of health status is the investments made in the health field and the expenditures of individuals for health. On the other hand, health expenditures consist mainly of treatment and pharmaceutical expenditures. Within the scope of human capital elements, schooling rate for education and pharmaceutical expenditures for health are included in the model in the thesis. Mushkin (1962), Becker (1964) and Fuchs (1966) stated that health capital is a component of the human capital stock. Grossman (1999) established a model of demand for health capital. Grossman's logic in modeling health demand is that an increase in health stocks will not only increase wage rates. Health capital is different from other forms of human capital. While an individual's stock of information affects productivity, the stock of health determines the total time it can spend to make money and produce commodities (Grossman, 1999, p. 2). In other words, unlike education, health does not affect an individual's productivity. This means that for a production function, while the advances in health change the production function, educational gains affect the slope of the production function.

On the other hand, in Solow regression models, total expenditure on health expenditures is important for health status.

1.4. PRODUCTIVITY AND HUMAN CAPITAL

Krueger (1968) emphasizes that the relationship between human capital and income is stronger than the relationship between physical capital and income. This finding is doubtful as it is accepted that human capital elements are affected by income. However, this finding requires microeconomic evidence. Mincer (1958, p. 295) shows that there is a strong relationship between the education and future income of individuals and the evidence obtained from microeconomic findings. And it shows that the relationship between individuals' education and their future income is largely unaffected by parental income.

1.4.1. Human Capital and Individual Earnings

The effect of human capital on growth ultimately depends on the relationship between education, health and productivity of the individual. Therefore, micro-evidence on the impact of education and health on productivity needs to be analyzed. The fact that experimental macroeconomic growth studies have microeconomic foundations necessitates this analysis.

Labor economists often examine the link between education and productivity. The standard empirical approach determines the change in wages of individuals by regression as the explanatory variable for education, age, experience, health and other characteristics. The most popular specification is predominantly based on Mincer's (1974) work and earlier contributions that give function to human capital.

Psacharopoulos's (1994) findings confirm that Mincer's results between education and return are different for developing and developed countries. According to the results reported by Psacharopoulos, the highest return in developing countries is observed in primary education. According to the same source, in developed countries, return increases with education level and the

highest return is observed at university level. Turkey has a structure similar to developed countries (Tansel, 2004). The highest return is observed for the university education level.

In the field of health economics, there are various studies on the endogenous causality between health and income. To explain the causal direction of health's impact on income, Smith (1999) uses life-cycle models that link health to future income, consumption, and welfare. Bloom and Canning (2000, p. 2) explain the causal direction with education, showing that healthy people live more and have higher incentives to invest in their abilities. Higher education provides higher productivity and therefore higher income.

1.4.2. Returns of Health and Education

There is controversy over the rejection of the assumption that marginal productivity is equal to social productivity. While human capital theory states that education increases wages as education increases productivity, the signaling theory shows that education increases wages where the level of education is a sign of the ability of workers. A particularly important argument is that educational wage differences can reflect the value of an educational capability. As a result, even the high private returns found by labor economists are potentially consistent with the view that education does not affect productivity

The signaling theory of Spence (1973) may manifest itself particularly in countries with poor educational quality. Although training in these countries does not lead to an increase in productivity, workers with high levels of education can be employed.

According to Tansel (1999), both social and private returns decrease as the level of education increases. While the highest return is obtained from primary

education in all over the world, the lowest return is from higher education. This is also true in OECD countries. It has been determined that university education level provides high returns in Turkey (Tansel, 2004).

The main issue is whether the investment in education and human capital increases the income with social income or private income. It is difficult to distinguish whether human capital increases income by increasing productivity or by giving a sign of ability. In other words, increased education and human capital leads to increased income due to signaling, but productivity does not change.

1.4.3. Health Technology and Pharmaceutical Expenditures

Health technology is associated with investments in the health sector mentioned above. Health technology also has an impact on health. Health technology is defined by the World Health Organization as "the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of life".

Health Technology Assessment (HTA) examines medicines, medical devices, surgical methods and health care systems in terms of medical, social, economic and ethical aspects. For example; health technology assessment is made when a new pharmaceutical is launched. In this evaluation, the market equivalents of that pharmaceutical, if any, are examined. HTA supports pricing and reimbursement by cost-benefit analysis.

Health expenditures generally cover expenditures for the protection and promotion of health. The increase in health expenditures positively affects the life expectancy and life quality of individuals. In addition, physical investments in the health sector (such as machinery and equipment) support technological

progress, technological advances stimulate growth, and growth leads to an increase in health expenditures again (Akar, 2014: 311).

Proper use of technology is one of the most important issues in the field of health. Technology is a concept that needs to be constantly evaluated. It should be evaluated continuously before the widespread use, shortly after it is used, and when the indications change. This assessment should include all scientific, economic, social and ethical dimensions. In many countries, the evaluation of technology is carried out in a systematic way. For example, the role of mammography in breast cancer screening, ultrasound in prostate cancer screening, monoclonal antibody therapy in cancer, bone density measurement are such technological advances.

The technology related to this field is defined by medical technology, health technology, health care technology and etc. In 1978, at the conference organized by the World Health Organization, medical technology was defined as follows: Technology means the combination of methods, techniques and materials and the people who use them, which have an important contribution to the solution of health problems. A similar definition of medical technology has been made in the form of all methods used by healthcare professionals to provide long-term care and rehabilitation, prevention and treatment of diseases.

Medical technology types

1- Medical devices

2- Materials

a) Consumables (syringe, slide, coverslip etc.)

b) Tools (sphygmomanometer, stethoscope, etc.)

c) Equipment (examination table, stretcher etc.)

3- Pharmaceuticals - Vaccines – Serums

4- Methods and techniques

5- Support, organization and management systems

Medical technology can be grouped as protection-related, treatment-related, and so on. Medical devices and materials are also classified according to the risk group they carry. According to these risk groups, different reliability criteria are sought in production and use.

Medical technology according to application areas:

- Protection related (vaccines)
- Screening (tuberculin test, mammography)
- Diagnosis related (computed tomography)
- Treatment related (pharmaceuticals, radiotherapy devices)
- Related to rehabilitation

Medical technology assessment is defined as the research methods that individuals need to make decisions about their personal health, treatment and care of health personnel, progress of medical products of industry, and regulation of laws and rules of politicians.

Health impacts, economic and social impacts of medical technology are examined in the evaluation of medical technology. Research techniques such as randomized clinical trials, cohort studies, and case control studies are used to evaluate the health-related effects of medical technology. Cost-effectiveness analysis, cost-benefit analysis and similar techniques are the basic research techniques in the assessment of economic impacts. The problems that can be created in the society and the public in terms of ethical, traditional and similar social values are examined in the evaluation of the social effects of medical technology. According to another data, 20% of the resources allocated to health in developed countries are spent on unnecessary or harmful medical methods.

On the other hand, the increasing use of technology facilitates access to health care for patients and improves quality of their life. Solutions to diseases have increased and the aging population has also increased due to the rapid

progress of technology in developed countries (Dönmez: 2012: 76). Although it is desirable to increase the aging population and prolong the life expectancy, societies should be prepared for this development. Technology provides convenience to aging people in many areas. In addition, technology creates social interaction and friendship, challenging activities that require power and learning opportunities (Fozard et al., 2009: 192). Modern technologies used for the extension of life provide the necessary opportunities for the elderly in terms of living and housing (Sayın, 2012: 535).

Another area where technology can make important contributions is elderly healthcare. One of the most important obstacles experienced by aging population is health problems. Medical technology is taking important steps in this regard. Developing medical technologies contribute to a better quality of life by reducing the time spent in hospital. Parallel to this technological progress, many products have been developed (Ekici, 2016: 28).

Information and communication technologies have the potential to improve the quality of life and reduce and improve barriers to access to health care. For example, real-time monitoring of the patient using wireless technology facilities, such as clothes, belts, accessories, watches, wearable clothing in the form of goggles, and devices that can be swallowed or inserted into the body, and many such products have significant impacts on health access and quality of care.

Additionally; left ventricular assist devices (LVADs), which provide long-term circulatory support, relieve the patient from attaching to the bed by taking the heart's load more effectively. While it provides an active life opportunity, it provides an important resting process that cannot be given to the heart by long-term bed rest (Vural et al., 1999: 393). The pacemaker detects the natural electrical activity of the heart and sends a warning when it detects that the heart rhythm is too low. It adjusts the heart's speed when the heart has no rhythm,

becomes irregular. Such products give patients the chance to survive and even improve their quality of life (Sert, 2016: 71).

Elderly people experience a decrease in their life functions in the important period of their life. Therefore, individuals need special services with the acceleration of aging in this period. In order to provide these special services to elderly people who sustain their lives with their family or in special care institutions, some technological requirements are needed. The prolongation of life expectancy throughout the world, however, the increase in chronic diseases raises the necessity of using technology in elderly care.

Hazer and Ateşoğlu (2017) have also shown the impact of technology on life quality. Data on 48 individuals with cardiovascular disorders are used as samples. As a result of the research; 79.2% of the participants were confident in the presence of the device they carry. The vast majority of respondents view technology moderately. 97.9% of respondents, who use technological products to remember medication hours, believe that technology greatly simplifies their daily lives. While more than half participants thought that their quality of life was partially affected positively after the devices they used, they stated that their pleasure from life changed.

70.8% of the individuals included in the study are in the 60-74 age range and 100% are individuals with cardiovascular disorders. It is seen that the life quality of these individuals who use a technological product to sustain their lives is positively affected.

As a result of the research, it was found that the quality of life scores of those who think that the auxiliary device used has a positive effect on life activities become higher. This is consistent with the results of the study conducted by Hamurcu et al. (2012) in order to determine the device satisfaction and patient satisfaction rates in patients using hearing aids. Similarly, it is in line with the

results of the study which investigated the positive effect of the knee prosthesis on the quality of patients' life.

The majority of the participants (97.9%) think that technology facilitates their daily lives. Again, 97.9% of them use smartphones to remind medication hours. In addition, 35.4% of assistive device users use heart support devices, 64.6% of them use pacemakers and 25.8% of them think that this device positively affects their daily life activities and 20.8% of them think that this device positively affects their quality of life. Finally, 79.2% of the participants think that the device partially changes the pleasure they receive from life.

1.4.4. Conclusion and Evaluation

Pharmaceutical industry is one of the priority sectors that have a main role in the success of the health sector. It achieve its goals in the field of economy with its deep-rooted and experienced firms, increased R & D spending, high production capacity, contribution to the employment of qualified labor force and growing export rate.

The pharmaceutical industry is based on advanced technology, continuous innovation, and needs to rapidly adapt to in scientific and technological changes. Within this structure, in order to protect the competitiveness of the industry, it is of great importance that the companies transfer the profits to the industry and keep their investment appetites. In fact, the current price and cost-oriented public policies have a significant share in the development of the sector.

In summary, with the public policies that will create leverage effect, industrial transformation is expected to accelerate investments. Increasing R & D competence, becoming stronger in the field of biotechnology, producing higher value-added pharmaceuticals, providing additional employment and contributing to the economy depend on the impact of public price and purchase policies.

CHAPTER 2

ECONOMİC GROWTH

In general, economic growth encompasses a wide area for organizing economic, social, political and institutional mechanisms for the improvement of people's living standards, as well as the effective dissemination of scarce resources to ensure sustainable economic growth (Todaro and Smith, 2012). In other words, economic growth, along with the economic growth in the long term, foresees the change and renewal of the social and cultural structure.

Goulet (2006) defines economic growth as economic, technological, social and political value change, and if an underdeveloped country resists change, three of the most likely to state are poverty, weakness and despair.

Hirschman (1958) sees economic growth as a jigsaw puzzle, emphasizing the multidimensional aspect of economic growth. According to Hirschman, it is very easy to locate a certain part in a puzzle when the location of the other parts is certain, but it is very difficult to locate the other parts of a puzzle with only one part specific. Moving from this analogy, it can be said that the sub-factors of economic growth (economic, social, political, cultural and institutional mechanisms etc.) are closely related, and that improvement in one would contribute to the development of the other.

In particular, economic growth and development are often used interchangeably. But it is necessary to distinguish these two concepts. Economic growth refers to the increase in the country's output level and per capita income. Economic development, together with economic growth, includes changes in output distribution and the structure of the economy. (Nafziger, 2005).

Economic growth encompasses many concepts that are not expressed numerically. Economic growth, unlike development, is concerned with quantitative improvements. But economic growth alone is not sufficient for economic growth. It is difficult to say that the growing economy will definitely assure development level.

2.1. MEASUREMENT OF REAL ECONOMIC GROWTH

2.1.1. GNP and GNP per capita

The GNP (Gross National Product) is the total value of the goods and services created by individuals in a certain period (usually within a year). The main factor in the GNP is the nationality of the country.

GDP includes goods and services produced by citizens of foreign countries operating within that country. In other words, the GNP shows the value of the factor income that a country's foreign nationals have sent to the country to be added to the GDP and the factor that the foreigners working in the country send to their own countries is deducted from the GDP.

When a country's GNP is divided by that country's population, the result gives per capita GNP. Some international organizations make some classifications in order to reveal economic difference between countries by using the GNP per capita value. The World Bank, which is one of these international organizations, makes a country classification by considering the per capita gross national product, as of July of each year.

It will be useful to mention two concepts frequently used in development terminology, developed and underdeveloped countries.

The following terms are sometimes used in the same sense for country classifications:

- Underdeveloped, developing, underdeveloped, poor, backward, third world and southern countries.
- Developed, industrialized, rich, advanced, first world and northern countries.

In developing countries, unlike developed countries, most commodity and resource markets do not function properly, producers and consumers do not have full knowledge, market price cannot be effectively determined by supply and demand, and market imbalances are very common (Todaro et al., 2012).

2.1.2. Purchasing Power Parity

In international comparisons, one must be cautious when using GNP and GNP figures in dollar terms in exchange rates. These values calculated according to the real exchange rates between the two countries with different levels of development. According to the purchasing power parity (PPP) approach for better comparison between growth figures, a currency conversion rate is calculated to eliminate the differences in price levels between countries. When calculating this conversion rate, both the foreign trade and non-traded goods and services are used.

The GNP and per capita GNP values calculated according to the purchasing power parity give more reliable results as they eliminate the price differences between the countries.

2.1.3. Physical Index of Life (PQLI)

It is stated that the increase of national income of a country is not enough for the country to be named as a developed country. In terms of their economic indicators, the two similar countries differ widely in social indicators such as child mortality, poverty, education, health and pharmaceutical expenditure. This

situation makes social indicators of national economies as important as economic indicators.

The physical quality of life proposed by the Council of Overseas Development consists of three social indicators. These are: infant mortality rate, life expectancy and adult literacy rate. The main purpose of this indicator is to measure the performance of the world's poorest countries in providing the basic needs of people (Morris, 1979; Nafziger, 2006). The physical quality index of life was published by Morris David Morris in 1979 for 150 countries (McGilivray, 2007).

2.1.4. Human Development Index (HDI)

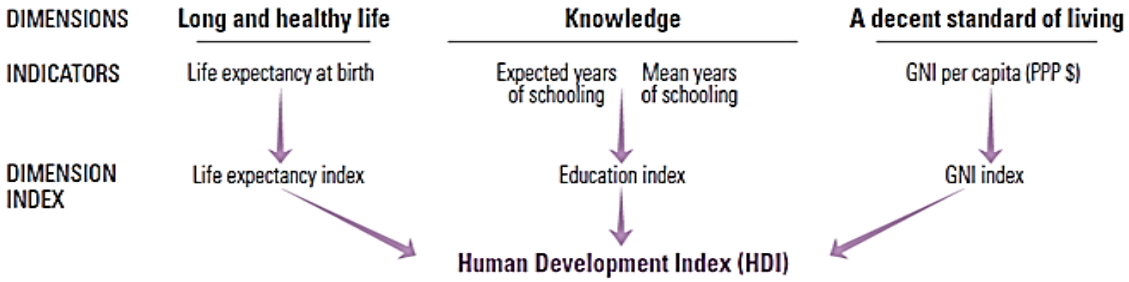
The Human Development Index (HDI), calculated by the United Nations Development Program since 1990, aims to measure human development through indicators such as education and health, as well as income, and is used frequently in international comparisons. This index lists countries with values between 0 (low human development) and 1 (high human development).

If we specifically analyze the components of the human development index: the standard of living is calculated on the dollar basis with the GNP per capita adapted to the purchasing power parity. The mean education duration and expected duration of education are taken into account when calculating the training index and the life expectancy at birth is used for the health index.

The lowest and highest values are determined for each of the above mentioned variables in the conversion of these three factors into the common unit and the creation of the index. Finally, a value between 0 and 1 for each variable is calculated and the human development index is calculated using equation 1. The approximation of the calculated value to 1 indicates higher economic development.

Human Development Index = $\sqrt[3]{\text{Life Standard} \times \text{Training} \times \text{Health}}$ (1)

Figure 1. Human Development Index



Source: UNITED NATIONS DEVELOPMENT PROGRAMME
http://hdr.undp.org/en/content/human-development-index-hdi

2.2. INDICATORS OF ECONOMIC DEVELOPMENT

Per capita GNP is the most important indicator of economic development, whether it is developed or developing country. Undoubtedly, per capita GNP is closely related to social indicators and is a necessary element for the emergence of development (Hicks and Streeten, 1979). But per capita GNP does not enough to show economic development alone. Because economic development is a multidimensional concept and GNP per capita represents only one dimension of economic development (McGilivray, 2007).

A multidimensional concept requires simultaneous assessment of conditions such as material standard of living (income, consumption and wealth), health, education, personal activities, policy and government, social relations, environmental conditions and distrust.

First of all, this concept is a mathematical expression and it is an average value. It does not have any information about how the income distribution is. In particular, if there is an inequality in income distribution in developing countries, this value loses credibility. In addition, the GNP values of countries may be

lower or higher than they are due to the national price differences between the countries. (McGilivray, 2007).

For this reason, Nordhaus and Tobin (1972) put forward the concept of the Economic Welfare Measure by making some arrangements in the GNP indicator. Nordhaus and Tobin reclassified health and education expenditures and accepted them as investments rather than consumption (Hicks et al., 1979).

2.2.1. Income Distribution

Income distribution; shows how the revenue generated within one year in the economy is shared by individuals or production factors. In societies where income is distributed unequally, it has been observed that the risks of policy uncertainty have increased and it has a negative effect on economic development.

Especially in developed countries where income distribution is fairly distributed, it is seen that social cohesion and solidarity are better provided and citizens of the country benefit from more social support and capital. As a result, a healthy population emerges (Deaton, 2001).

There are many reasons why many developed and developing countries are interested in income distribution. In general, inequality in income distribution is one of the main factors that give rise to poverty. Because, inequalities in the average income, education, land ownership, etc., ensure higher absolute and relative poverty (McKay, 2002).

Therefore, poverty and inequality in income distribution are two concepts that influence each other and there is a trade-off between them. In this context, one of the most important goals of economic development is preventing poverty by ensuring more equal distribution of income (Levin and Bigsten, 2000). From a historical perspective, it is observed that states governed by the oligarchy in the

past have seen the distribution of income as a natural process, but in modern societies today this opinion has been demolished and the population has less tolerance to the inequality in income distribution. This leads policy makers to develop policies to improve income distribution (Afonso and Schuknecht et al., 2008). Since the prerequisite for policy development is to identify the problem, it is important to measure inequality in income distribution inequality.

Functional income distribution and personal income distribution are two approaches which are used to see how equal a country's national income is distributed among individuals. The functional income distribution shows the share of the income among the production factors, i.e. the share of the wage, the share of the rent, the interest, in national income. Personal income distribution shows the distribution of national income between individuals and / or consumer units (households).

Lorenz Curve and Gini Coefficient are used to measure the inequality of income distribution in a country. By these two indicators, households or individuals are ordered from poor to rich. Then all individuals are divided into percentage groups and the income of all these groups is calculated in percent of GDP. Finally, the income shares received by the groups are cumulatively reflected in the table, personal income distribution table and then Lorenz Curve are created (Soubbotina and Sheram, 2000).

2.2.2. Human Capital

Human capital is a very important factor for achieving a desired level of economic development. The human capital theory, developed by economists Milton Friedman, Gary Becker and Jacob Mincer after World War II, examines the benefits of human capital for individuals and society and enables people to invest in themselves through education, training or other activities, thereby rising their income by increasing their lifelong earnings. (Bloom and Canning et

al., 2006; Özsoy, 2007). Human capital consists of two main components: education and health.

2.2.3. Education

Education is one of the most important components of human capital. Education plays a major role in promoting economic growth and improving living standards, and has been recognized as the most important part of social and human development since the establishment of the United Nations in early nineteenth century. For this reason, it is seen that governments prioritize education and rapid development of education systems in the years following World War II.

Many economic models show that adult education is the most relevant aspect of education. However, the lack of data sets that directly measure adult skills is an obstacle in international comparisons. Therefore, some representative variables are used in the literature instead of adult skills (Green and Little et al., 2007). One of these variables is the literacy rate because one of the most typical features of the underdeveloped countries is low literacy rates.

The literacy rate of the less developed countries is seen as rural in terms of regions, and it is seen as unbalanced against women in terms of gender. In addition, some other variables used to explain the level of education is; the share of education expenditures in the GNA, the number of students per teacher and the enrollment rate.

2.2.4. Health

Health, which is the other component of human capital, is one of the main inputs of economic development because social, financial, political development depends on healthy consumers and producers.

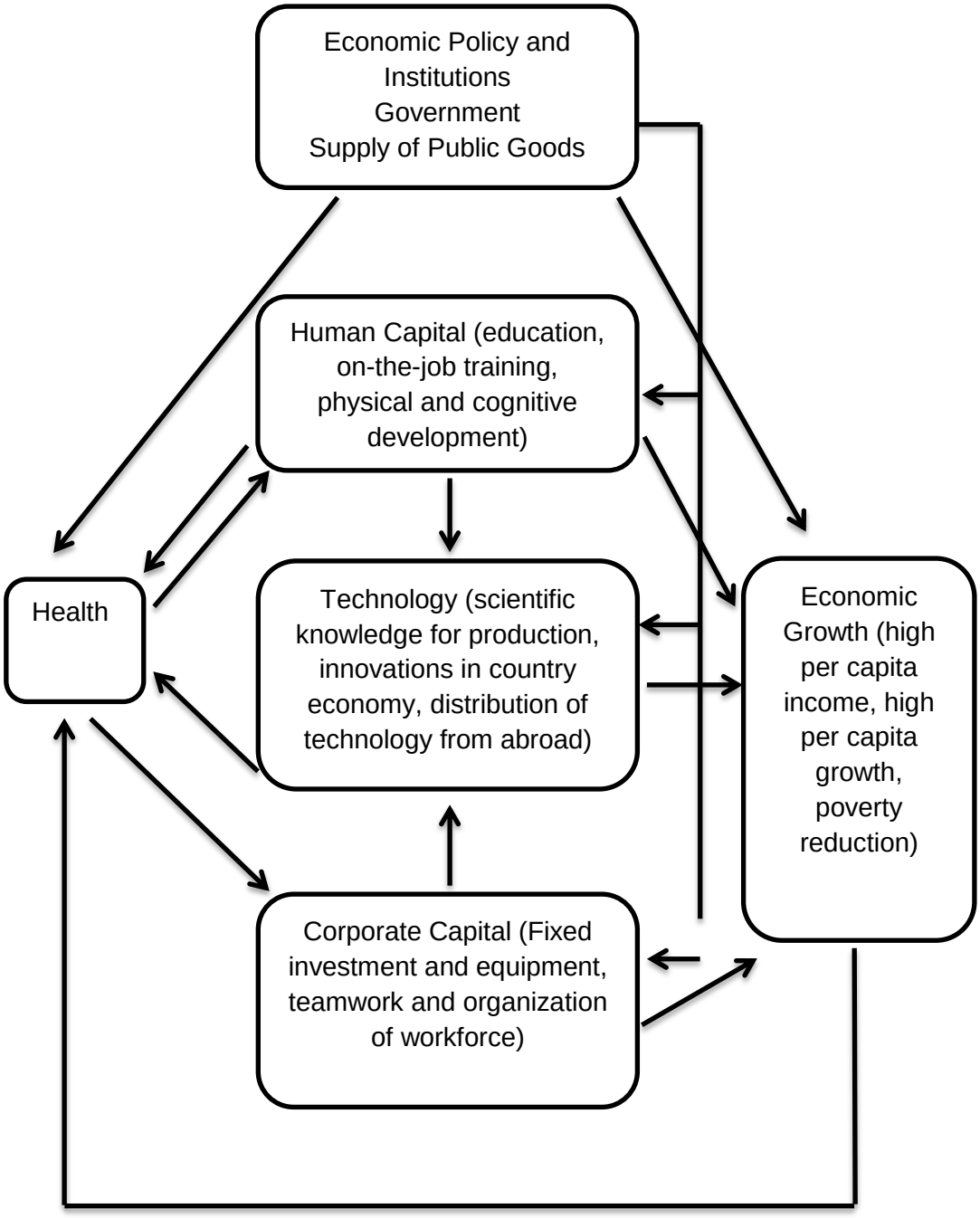
For individuals and families, health provides economic confidence and personal growth for the future, and productivity is the basis for intellectual, physical, and emotional development in school. In other words, there is a strong causal relationship between health and the level of economic development (World Health Organization, 2001). At the same time, recent studies suggest that economic development increases life expectancy and welfare, and decreases child mortality and birth rates. Accordingly, high labor productivity results in improved health structure (Kahn and Yang 2008). It is a fact that there is a causality relationship between economic growth and health, from economic growth to health or from health to economic growth (Preston, 1975; Smith, 1999).

As a component of human capital, health affects economic performance both directly and indirectly. The impact of health on labor productivity is a direct effect. An increase in the future income of a healthy child can be accepted as an indirect effect (Lustig, 2006).

If citizens of a country are healthy, they get some economic benefits. For example, a 10% reduction in the number of deaths due to heart disease alone is more than $ 4 trillion, with a 1% decrease in the number of deaths from cancers has a value of more than $ 430 billion (Murphy and Topel, 2003). A 10-year increase in life-span provides an increase of 4.5% in savings rates (Bloom and Canning et al., 2003).

As can be seen, a health condition of the community leads to a significant increase in economic welfare indicators.

Figure 2. Health as an Input of Economic Development



Source: Macroeconomics and Health: Investing Health For Economic Development, Report of The Commission on Macro Economics and Health, World Health Organisation, 2001. p.26

Figure 2 shows the place of health among other indicators of economic development. Accordingly, economic output; economic policies are a function of human capital, technology and institutional capital. The fact that health is important for human capital and institutional capital makes it to have impact on

economic growth (WHO, 2001). Nevertheless, it should be kept in mind that there is no relation between population health and economic development (Acemoglu & Johnson, 2007).

2.2.5. Population

It is accepted that the growth rate of population has both positive and negative effects on a country's economy. While some researchers find relationship between population growth and economic growth positively, some argue that such a positive relationship will not occur.

Since per capita national income is more meaningful than national income in terms of economic development, there is a close relationship between population growth rate, national income growth rate and living standard. Therefore, the relationship between the rate of population growth and the rate of national income growth is extremely important (Feldstein, 2006) because the country's population needs to be balanced with the economic resources of the country. The population providing this balance is called the “optimal population”. If the population growth rate is high, the urbanization is accelerating, the current expenditures increase and this situation causes the reduction of the resources allocated for economic development (Tonus, 2014). Apart from this, the content of the population, (i.e. whether the population is elder or young) is of great importance. The older population shows low participation rate, savings rate and economic growth, while the younger population shows higher participation and savings rate.

2.2.6. Savings and Investment

One of the most important indicators of economic development is capital accumulation. Capital accumulation is the most important source of both revenue and production capacity increase. In an underdeveloped country where the national income is low and the population increases rapidly, the factor that

prevents the increase in the amount of capital is the increase in the amount of consumption. Because in a society where income per capita is low, a large part of the income is allocated to consumption and a small part is allocated to savings (Yavilioğlu, 2002).

If there is not enough capital accumulation in a country, it is very difficult to talk about an investment rate that is nurtured by domestic savings. Therefore, the country in question starts to seek financing from the other countries which have surplus savings. This raises the current account deficit, which is one of the most important problems of developing countries. A country that does not want to experience current account deficit needs to ensure a balance between savings and investment.

There are many studies in the literature that examine the relationship between savings and investment. For a developing country, less than 15% of gross national product is invested. In contrast, in developed countries, the ratio exceeds 15%.

2.2.7. Sectoral Structure

Considering the share of the sectors' GDP and the sectoral distribution of the employees by taking into account the level of development of the countries, it is observed that generally in underdeveloped countries, the general appearance is in the form of agricultural dominance, together with relatively small industrial sector.

In developed countries, both employment and output of agricultural sector have a small share in national income. This ratio is around 1% in developed countries e.g. the United States and the United Kingdom, despite high productivity in agriculture. However, the share of the population working in the industrial sector in developed countries is also less than that in developing countries because the working population in developed countries is shifting to service sector over

time. According to many development models, the share of employment in the industry is gradually decreasing and the service sector is increasing as countries converge to the level of developed countries.

2.2.8. Urbanization Rate

In underdeveloped countries, the majority of the population lives in rural areas as the overall appearance is a rural agricultural structure. In this section, due to incomplete information and social segmentation, the market structure is deteriorated and population becomes poorer.

However, if the population is massively migrates to the cities the problem of rapid urbanization emerges (Todaro et al., 2012).

Together with rapid urbanization, a dual structure emerges in which modern and traditional sectors carry out their activities together. The dualist structure can be observed in both developed and underdeveloped countries. But it is more common in less developed countries.

2.2.9. Conclusion and Evaluation

In this section, the conceptual framework, measurement and indicators of economic development are discussed. Attention is drawn to the aspects of economic growth which is related to human and social capital. In this context, it is concluded that human beings are at the core of growth and development.

CHAPTER 3

PHARMACEUTICAL SECTOR AND EXPENDITURES

The main actors of supply and demand do not have an impact on the pharmaceutical market as in other markets. Private and public health insurances, public expenditures, fiscal balance, the existence of reimbursement systems, public utility, and the need for effective use of the pharmaceutical and their interaction all emerge conditions for comprehensive regulation for regulation.

It is observed that there is a steady growth of pharmaceutical expenditure in the world and Turkey. This increase in expenditures is due to higher pharmaceutical prices and the hike in amount of pharmaceuticals sold.

Public intervention in the pharmaceutical sector is characterized as a public policy for the limitation of private sector practices related to medicines by the state. Public regulations in the pharmaceutical sector are made for the quality, safety and suitability of pharmaceuticals. The main focus of the interventions in the pharmaceutical industry is the protection and progress in public health. The state intervenes in the pharmaceutical sector in order to protect consumers during the treatment period. Sometimes these arrangements can also be made to limit or reduce public expenditure. The natural structure of the products produced in the pharmaceutical industry restricts trading of them in the market like any other merchandise. In country practices, governments often make a number of intrusive arrangements on the production, export, import, storage, pricing and prescription of pharmaceuticals. The public intervention in the pharmaceutical sector is also related to the development level of the countries. Thus, while the state intervenes in the pharmaceutical sector only for the quality and safety of pharmaceuticals in developed countries, there are public regulations on many issues related to pharmaceuticals in developing countries (Top, Tarcan, 2004, 21).

Another issue related to regulation is the duration of the regulation process applied to the market. Whether reimbursement of pharmaceutical or not is important with regard to manufacturers. Because the patient will not want to take a pharmaceutical that is not within the scope of reimbursement from own out of pocket even if the price of the pharmaceutical is very low. Most price arrangements are very closely related to cost. Known costs are the costs required by the manufacturer during the production and development stages of the product. Other potential costs for producers, patients and the community are the delay of the product on the market. Therefore, a short regulation process that is effective, high quality and does not affect decision makers is important in terms of earnings of the producers and quick access to treatment opportunities of patients (Lundkvist, Jönsson, Rehnberg, 2006, 338). Many countries use their own national price controls or price controls permutations for the formation and determination of pharmaceutical prices.

3.1. PRICE CONTROLS

When investigating the effectiveness of price controls, benchmarking of a perfectly competitive market may be the basis. However, as in every other market, the perfect competition market does not exist in the real world. In the pharmaceutical market, monopolistic components such as market failures giving rise to externalities, patent protection, etc., disrupt the functioning of competition laws.

Mainly, price regulation systems can be grouped under four main headings.

- Free pricing systems without any restrictions
- Free pricing systems where a limit for reimbursement and health insurance funds is defined
- Non-direct price controls through profit controls
- Systems where price is directly determined by the state (Moen et al., 1998, 108).

The direct control measures of pharmaceutical prices commonly include measures such as agreed prices, maximum fixed prices, international price comparisons and price cuts or price freezing. These methods can be expressed by the term of direct price controls. Alternative approaches include, for example, controlling reimbursement levels through volume increases instead of price reductions. Indirect control approaches include setting reference prices (reimbursement limits) or controlling profits (Kanavos, Üstel, Font, 2005).

Table 1. A Summary of The Methods Applied In The Regulation of Pharmaceutical Prices In EU Countries, 2003

	Market segment	Free pricing	Direct price controls	Use of international price comparisons	Profit controls	Reference pricing
Austria	In-patent		✓	✓		
	Off-patent		✓	✓		
Belgium	In-patent		✓	✓		
	Off-patent			✓		✓
Denmark	In-patent			✓		
	Off-patent			✓		✓
Finland	In-patent		✓	✓		
	Off-patent		✓	✓		
France	In-patent		✓	✓		
	Off-patent					✓
Germany	In-patent	✓				
	Off-patent					✓
Greece	In-patent		✓	✓		
	Off-patent		✓	✓		
Ireland	In-patent		✓	✓		
	Off-patent		✓	✓		
Italy	In-patent		✓	✓		
	Off-patent					✓
Luxembourg	In-patent		✓	✓		
	Off-patent		✓	✓		
Netherlands	In-patent		✓	✓		✓
	Off-patent		✓	✓		✓
Portugal	In-patent		✓	✓		
	Off-patent			✓		✓
Spain	In-patent		✓	✓		
	Off-patent			✓		✓
Sweden	In-patent		✓	✓		
	Off-patent		✓	✓		
UK	In-patent	✓			✓	
	Off-patent		✓			

Source: (Mossialos, E., Mrazek, M., Walley, T., 2004) “Regulating Pharmaceuticals in Europe: Striving for Efficiency, Equity and Quality”, Open University Press, England., s.115.

Table 1 provides a summary of the pharmaceutical regulations in the European Union countries. The remarkable point here is that direct price controls are widely used for both patented and non-patented products.

Direct price controls may seem more effective than non-direct price controls due to the decrease in prices. Non-direct strategies are perceived as more dynamic strategies since their reflection in the market is considered to be more comprehensive (Hakonsen, Horn, Toverud, 2009, 277).

Direct price controls are applied based on the medical value of the pharmaceutical and compared to the domestic and international competitors. Methods such as maximum pricing, price cuts, sales volume pricing can be used. With a few exceptions such as Germany and the UK, European countries used direct price controls on patented products. Non-direct price controls mainly consist of profit controls and reference pricing, such as the UK example (Hakonsen, Horn, Toverud, 2009, 277-278).

3.1.1. Direct Price Controls

Direct price controls aim at fixing maximum pharmaceutical prices. The reasonable maximum price varies from country to country and depends on many factors, including budget limits, prescription behavior, use patterns and the importance of the pharmaceutical industry in the national economy. Direct pharmaceutical controls are generally applicable to all medicines or to specific product groups (e.g. reimbursed, inpatient / outpatient, patented / non-patent) whether or not reimbursed. In many European Union countries, the regulated price usually constitutes the market price, as the law generally requires that a pharmaceutical can be sold at only one price. When patented new pharmaceuticals are placed on the market, all European Union countries except the United Kingdom and Germany where they can be freely priced, implement direct price controls. Nevertheless, the French Economic Committee may formally appeal the proposed price. In addition, in most European Union

countries, cuts in these fixed prices and price freezing application have been common to the extent that managers need to overcome short-term budgetary difficulties (Kanavos, Üstel, Font, 2005).

The aim of various methods of direct determination of prices is to stabilize the prices of medicines in the health system at a reasonable and affordable level. How the reasonable price is defined largely depends on the importance of the pharmaceutical industry in the national economy. Prices are controlled either by direct negotiations (Austria, France, Italy, Portugal, Spain), or by national authorities on a number of factors, including arbitrary criteria that lead to subjective, partiality and non-transparency. The assessment of which factors depends on whether the main objective of the regulatory body is to reach the lowest possible price or to reach a price level that balances industrial incentives and profitability with cost control targets. For example, Spain applies a cost-plus formula to the price control system by law. (Kanavos, Üstel, Font, 2005, 53).

Finland also includes comparable parallel import prices to its average price comparisons system. While price comparisons are considered as a basis for ensuring the fairness of the price regulation process, methodological problems may be experienced in these comparisons. Furthermore, it may become more complicated if there is a difference in dosage unit, formula and packing size between a product's present form in a particular market and its form in other countries (Kanavos, Üstel, Font, 2005).

Direct price controls may be effective in reducing the price of pharmaceuticals, but the market structure should be considered effectively in the implementation of this method. The balance between supply and demand, the access of patients to the pharmaceutical, the likelihood of pharmaceuticals out of the market and monopolization should be taken into account.

3.1.2. Profit Controls

The Pharmaceutical Price Regulation Scheme (PPRS), which has been implemented since 1957, is a UK-specific system. The country indirectly regulates the prices of branded medicines sold to NHS (National Health Service) by determining the profit limits in this way. Its aim is to achieve a balance between a profitable pharmaceutical industry that can provide pharmaceuticals to the NHS at reasonable prices, cut down on rising hospital costs, and also enable competitive development of new pharmaceuticals. PPRS is a voluntary agreement between the Ministry of Health and the British Pharmaceutical Companies Association (Moen et al., 1998, 110).

There is a risk of regulatory capture as target profits are negotiated and this process may not be transparent. Determining the appropriate or fair rate of return requires an in-depth understanding of the nature, functioning and performance of the industry (Kanavos, Üstel, Font, 2005, pp. 52-6).

3.1.3. Parallel Trading

Parallel trade is defined as trade from countries with a low price to countries with a high price. Inexpensive pharmaceuticals in the UK are purchased by the National Health Service. The some countries encourage pharmacists to import cheap ones of pharmaceuticals produced in domestic market. These pharmaceuticals are imported from Spain and Italy and are forecasted to represent 15 % of domestic consumption (Vogel, 2002, 1220).

A prominent issue within the framework of the ongoing Customs Union relationship between the European Union and Turkey is parallel trade. In this context, by importing pharmaceuticals from a country with cheap prices to another country where it is expensive, it is possible to lower the prices of pharmaceuticals in the country or to increase the profits of the distributors. Although Turkey takes part in the Customs Union, Turkey cannot benefit from

parallel trade based on the principle of exhaustion of rights within the EU borders and freely applied legally between EU Member States. The reason for this is that "the principle of the exhaustion of the intellectual, industrial and commercial property rights" valid in the community is not stipulated for commercial relations between the parties in the Association Council Decision regulating the relations existing between the EU and Turkey Customs Union (TOBB, 2008).

Some pharmaceutical warehouses may be able to sell the products of the exporting pharmaceutical companies by providing them from the national market, at a much cheaper price than the prices determined by the company for the market, as they do not have the costs of licensing and publicity. In this case, the pharmaceutical company that invests in the said country may be in a difficult position both before the country health authorities and the business partners in the country. Another important problem in the background of the pharmaceutical problem due to fluctuations in the exchange rate is parallel exports. Parallel trade is not prohibited by any legislation in some countries. Thus, it is possible to damage the country image, the achievements of the country and its brands.

The European Union (EU) is the pioneer of parallel trade in the world. The parallel trade within the Union is made within the framework of the common economic market and the free movement of goods. On the other hand, however, there are controversies and conflicts. For example, in some countries, including the United States, parallel trade of pharmaceuticals is prohibited.

Pharmaceutical exports are made in the scope of the formal letter about that it does not contain narcotic pharmaceuticals and psychotropic substances taken from the Ministry of Health via pharmaceutical companies, pharmaceutical warehouses and foreign trade companies assigned manager. In the framework of the Regulation on Pharmaceutical Products and Products in Pharmacy Warehouses, pharmaceutical warehouses can sell to pharmacies, other pharmaceutical warehouses and buyers abroad. In this case, the export of

products obtained by the pharmaceutical warehouses from the producers or other pharmaceutical warehouses is covered by the legislation. The illegal part is supply of prescription pharmaceuticals from pharmacies by the exporter pharmaceutical warehouse as a non-prescription and wholesale, although it is prohibited under the "Regulation on Pharmacists and Pharmacies". Although there is no obstacle in the export of these products through pharmaceutical warehouses, there are many drawbacks.

Whether the distribution of these pharmaceuticals is made in accordance with the rules of Good Distribution Practices (GDP) which is an international requirement for pharmaceuticals cannot be followed by licensed pharmaceutical companies. This would damage the pharmaceutical manufacturers and the country's brand perception.

In addition, pharmaceutical companies try to license their pharmaceuticals at the highest possible price after a serious effort in the country they will export. For the introduction and distribution of medicines to health professionals, they work exclusively with local distributors and shares profit. Therefore, pharmaceutical companies enter the market with high cost burdens. Pharmaceutical warehouses can sell at a much cheaper price than the prices determined by the company for that market, since it does not have expenses such as licensing and publicity. In this case, the pharmaceutical company reduces the price of the product or withdraws from the market.

On the other hand, it is a fact that foreign trade opportunities and foreign exchange inflows have been provided by selling the products which belong to many domestic manufacturers. These manufacturers also do not have investment to foreign markets.

In addition, sales of products to foreign countries are mostly done on imported pharmaceuticals. Countries where the some pharmaceuticals are cheapest in the world and easy selling of non-prescription pharmaceuticals help many

pharmaceuticals to easily export. This is one of the biggest factors leading to the absence of imported in the market shortly before expected exchange rate value rise.

3.1.4. Compulsory Licensing

Compulsory licensing can be defined as the permission of the state to the production of threatened goods without the consent of the patent owner. Mandatory licensing forces the patent holder to make products available to others by a fee set by the government. Canada is one of the countries using this system. This practice did not have a significant effect on pharmaceutical prices. But it has had a great impact on promoting Canadian pharmaceutical companies to do R & D (Vogel, 2002, 1220).

Such a regime of regulation is of little interest in the literature of regulation and health economics. In the World Trade Organization protocol, mandatory licensing has been adopted to prevent the tragic consequences of human health in underdeveloped or developing countries with insufficient pharmaceutical industry or financial difficulties to provide vital pharmaceuticals. The main purpose of the application is to enable less developed countries to reach to the vital patented pharmaceuticals (TOBB, 2008).

Some countries that have ratified this protocol are Australia, the United States, India, Israel, Japan, Norway, Korea, Singapore and Switzerland. Regulations on mandatory license have been made in the European Union within the framework of the decisions adopted by the WTO (TOBB, 2008).

3.1.5. Other Agreements between State-Pharmaceutical Companies

Government-firm agreements are generally aimed at achieving price reductions by making the industry responsible for public pharmaceutical expenditure targets and / or collecting extra earnings from the firm.

3.1.6. Reference Pricing

Reference pricing is the system in which authorities or private insurers determine the maximum reimbursement level for a group of pharmaceuticals. Pharmaceuticals in the defined group may include generically equivalent pharmaceuticals or pharmaceuticals which are therapeutically equal but generically unequal. The specified reference price is the maximum price that private or public insurance will be willing to pay. If the selling price of the pharmaceutical is higher than this price, the patient has to pay the difference (Moen et al., 1998, 108).

The reference price is generated on the basis of a median, minimum, etc. point in the distribution of producer supply prices. Manufacturers are free to create their own prices. If the price determined by the manufacturer exceeds the reference price, the patient pays the price difference (Danzon, 2001, 1).

Reference pricing was first introduced in 1989 in Germany. The inclusion of therapeutic pharmaceuticals in the group is also applied by some countries. Germany and the Netherlands are examples of these countries (Moen et al., 1998, 108). Therapeutic reference pricing applied by Germany, the Netherlands and New Zealand includes the cluster from generic pharmaceuticals (the same molecule) to different molecules for the same indication. The efficacy of therapeutic pharmaceuticals in the same treatment may be controversial. Another problem is that patients may prefer the old technology to the new one because of the fact that the price of new technology therapeutic pharmaceutical with different content may be higher. At this point, we may face problem that the patient who can able afford to pay can have new technology.

When examining reference pricing methods, it is necessary to distinguish between generic reference pricing and therapeutic reference pricing programs that apply to generically equivalent products with the same active ingredient and formula. Although generic reference pricing has been set as a common

reimbursement limit for non-patent original pharmaceutical and its generics (the same active substance), therapeutic reference pricing includes all pharmaceuticals deemed to be comparable by the regulator, usually based on mechanism of action, pharmacological properties such as duration of action and form of administration, and/or indication. (T. Stargardt, S. Vandoros, 2014, p. Encyclopedia of Health Economics)

The one example of generic referencing is a settled application called MAC (Maximum Allowed Charge) in the United States for the reimbursement of patent-expired, multi-source components with at least one generic, used by Medicaid and several maintenance programs. MAC defines a maximum amount of reimbursement based on a relatively inexpensive generic for a given molecule, formula and activity. The patient who wants to buy the original product has to pay the difference himself. Similar generic reference pricing systems have been implemented in the United Kingdom and in some states of Canada for many years. Generic reference pricing is not only effective in reducing the patent durations of the original products because they are applied to patent-expired medicines. Since the 1990s, generic referral has been introduced in many countries, including Sweden, Italy, Spain and Denmark (Danzon, Ketcham, 2003, 3).

Therapeutic reference pricing covers a wide substitution from generic products to different molecules for the same indication. Therapeutic referral is a more controversial model because it makes the same treatment to different active ingredients in spite of its possible different activities or its side-effect in some patients. Collecting patented products and patent expired products in the same class reduces the effective patent period and significantly promotes R & D (Danzon, Ketcham, 2003, 3).

In the European Union, the reference pricing process has become widespread. Because this application is effective in reducing the price differences between pharmaceuticals that can be substituted by improving market transparency.

Countries' systems differ from each other in terms of scope, pricing method and whether patented pharmaceuticals should be included. In general, reference pricing is applied to pharmaceuticals known to be of the same category, known to have similar treatment mechanisms or clinical treatment results. However, if these are not generic equivalents, these classifications can often be subject to discussion. (Kanavos, Üstel, Font, 2005, 52-62).

Different mechanisms are used to calculate the reference price. The results obtained from the studies in the countries which apply reference pricing indicate a decrease in prices. As a result, prices of both the original and the generic equivalents are reduced. In Germany, after the patients switched to reference price pharmaceuticals, similar price decreases occurred and the patients provided additional savings. Many companies in Germany have reduced their prices. (Kanavos, Üstel, Font, 2005, 52-62).

While the reference pricing application provides some savings in pharmaceutical expenditures, the increase in the consumption and the price of the pharmaceuticals other than the reference price system can generally eliminate the pharmaceutical savings obtained with this application. For example, in Germany, some physicians have prescribed medicines that are not included in the reference price system, instead of losing time discussing about their contribution payments with their patients. The price of pharmaceuticals other than the reference price system has thus increased compared to the early stages of the German reference price system. A similar result in the reference price system in New Zealand has encouraged the state to supplement this practice with cross-product agreements, which allow the acceptance of the requested price of a new pharmaceutical, while reducing the price of another unrelated pharmaceutical. (Kanavos, Üstel, Font, 2005, 52-62).

A more comprehensive analysis of the impact of the reference price system in particular in Europe is needed. Evidence of reference pricing is mostly based on aggregate data. Research has contributed to our understanding of how such

systems work, but some have controlled the impact of other cost control measures.

3.1.6.1. Effects of Reference Pricing

The purpose of the reference pricing is not to limit all pharmaceutical expenditure, but to take control of third-party pharmaceutical expenditures in prescription pharmaceuticals. The government aims at reducing the prices of reference products and reducing the demand for high-priced products by limiting the amount of reimbursement of pharmaceuticals (Casasnovas, Junoy, 2000, 5).

The effectiveness of the reference pricing can be evaluated in terms of access of patients to medicine, effects on out-of-pocket payments, effects on health expenditures, increase in hospital or doctor visits due to complications or prescription changes, effect on pharmaceutical expenditures, production amounts and innovation incentives of new pharmaceutical (Danzon, Ketcham, 2003, 12).

3.2. REIMBURSEMENT

The demand law in the pharmaceutical sector does not directly work because the end consumer is not the decision maker. Moreover, the consumer cannot afford the full cost. The determination of demand is different from traditional methods due to the existence of health insurance. The main issue is how much of the pharmaceutical cost is covered by compulsory or private insurance. Expenditures decrease if the patient meets the full cost of the pharmaceutical; the known demand law begins to process. Expenditures increase if this cost is covered all by health insurance. In other words, if consumers have to provide very low or zero contribution to access pharmaceutical, it can lead to moral hazard. The moral hazard arises from practices that individuals benefit from health care in an unfair and inequitable form, and also disrupting good faith.

Health insurance leads to moral hazard, which has a high financial impact. In the national health insurance system, redistribution of income and compulsory participation of persons in the risk pool is a concern. This situation causes cross-subsidization between individuals. As a requirement of social state structure, social insurance application cannot be given up at the expense of the moral hazard.

Health and medicine expenditures are financed by premiums collected and tax revenues. Due to the aging population in the world, health spending is constantly rising and governments are taking additional measures to overcome this situation. These measures are mostly related to the control pharmaceutical expenditures.

When different practices are examined, it is understood that many different pricing policies are implement by different countries. However, it is observed that expenditures are not at the desired levels. In order to control expenditures, a number of measures must be taken on the amount of pharmaceuticals consumed. Prevention of pharmaceutical consumption and choice of the most effective and cheap pharmaceuticals within the generic pharmaceuticals by doctors and patients are the base of these measures. In this framework, some methods applied by reimbursement agencies are as follows:

- Preparation of prescribing guidelines, training and information activities, monitoring of prescriptions, determining of prescribing quotas, preparation of pharmaceutical budgets,
- Generic substitution policy, financial incentives for the delivery of cheap medicines, and withdrawal of a certain portion of the pharmacies' gain in the distribution phase,
- Information on pharmaceutical consumption and education activities, generic pharmaceutical application and cost sharing applications.

These applications can be considered as demand-side control policies in the literature. On the other hand, it is necessary to mention cost sharing, generic pharmaceutical application and bidding, which are the most common reimbursement policy instruments.

3.2.1. Methods for Controlling Expenditure in Reimbursement

3.2.1.1. Cost Sharing

Cost sharing, or more commonly, participation fee application is based on the payment of a certain portion of this cost by individuals covered by insurance, even if the cost of the pharmaceutical is covered by compulsory or private health insurance. This practice helps authorities and insurers, it is aimed to control the demand (increasing the consumer's price sensitivity) and transfer some of the financing burden to the consumers.

Country practices are usually based on the payment of a certain percentage of the pharmaceutical purchased by the patient. In some countries, different contributions are paid for different pharmaceutical groups or differentiation of rates is adopted after a certain consumption level. Selected country practices are as follows.

Belgium: Patients pay a certain part of the total cost for medicines subject to reimbursement. The contribution is the same for all, except for persons with differentiated reimbursement status (widows, orphans, retirees, persons with disabilities and low income groups). The participation share is limited to a certain percentage of the cost and cannot exceed a certain monetary threshold. In addition, different participation rates have been determined for different pharmaceutical groups. The importance of pharmaceuticals is taken into consideration in determining rates.

Austria: Patients pay a prescription fee when receiving a prescription from a contracted doctor in the Austrian social security system.
Denmark: There are participation fees varying according to the amount of individual expenditures.
Spain: Participation rate is 40% for persons under 65 years of age. The participation share is not taken from people above this age and persons with disabilities.
Sweden: In Sweden, as in Denmark, the participation shares are regulated by specific thresholds.

When successfully designed, the participation rate reduction reduces both unnecessary pharmaceutical consumption and reimbursement expenditure and increases supplier-level competition. Thanks to this application, consumers are more sensitive to the price and thus, the market share of low-priced pharmaceuticals is increased.

3.2.1.2. Equivalent Pharmaceutical Application

Equivalent pharmaceutical practice aims to evaluate similar quality products together and to increase the price competition among them. This practice directs consumers to lower prices among similar products and it also allows for the purchase of more expensive products, provided that the difference is covered by the consumer. Consumers' price sensitivity is high in high-priced products, and low in the price of reimbursement price-level products. Equivalent pharmaceutical application is forcing branded product providers to choose between reducing the price to the price of reimbursement or, without regarding this, charging the old high prices in exchange for the brand premium, which require costly marketing and sales efforts.

Equivalent medication is often considered as an additional measure in countries where price controls exist. The most important exception to this situation is Germany case. In Germany, pharmaceutical prices are not interfered by the

state in any way, but even patented pharmaceuticals fall within the scope of the equivalent pharmaceutical application. Equivalent pharmaceutical application has been one of the most studied subjects in the economic literature. Although it is accepted as an indirect price control method, it is adopted as a more liberal system than direct price control.

Danzon and Chao (2000) stated that regulation would eliminate the consequences of competition in markets without patent protection. In this case, it is stated that the potential budget savings in the post-patent period cannot be fully achieved, especially in countries with heavy price regulations.

In the light of the findings of this study, it was concluded that sufficient generic pharmaceuticals should be placed on the market before referring to the price of the lowest price pharmaceutical. If there are not enough agents in the market, it will not be possible to reach a competitive environment that will provide gains for reimbursement institutions.

Pavnick (2002) examined the use of therapeutic equivalent pharmaceuticals in Germany in 1989. By using data from two different therapeutic areas (oral antidiabetics and anti-ulcer pharmaceuticals), it was found that significant price decreases occurred in both generics and original pharmaceuticals between 1986 and 1996 by the use of equivalent pharmaceuticals. It is concluded that price decreases are more in the original products.

Brekke, Grasdal and Holmas (2009) included highly patented products in the data set. It has been seen that the equivalent pharmaceutical application causes a large price reduction and this reduction is more in the original products.

Augurzky et al. (2006) examined the German system and formed a panel of approximately 4 million observations. According to the results of the study, the

effect of a 1% change in the amount of reimbursement leads to a upward move of 0.3% in the market price. In addition, in the groups where the equivalent pharmaceutical practice is applied for the first time, an average of 14% price decrease occurs.

According to the first results reached by Brekke, Holmas and Straume, equivalent pharmaceutical administration leads to significant price reductions in both the original product (33%) and in the generic product (22%). These results, however, may vary according to the externality of the price.

In the case of equivalent pharmaceutical administration, the reimbursement price leads to a decrease in price for the original products when externally determined, while leads an increase in the price of generic pharmaceuticals above the reimbursement price. In the case of the prices are determined internally, the practice encourages decline in generic pharmaceutical prices. In this case, generics make the original pharmaceutical more expensive compared to its substitutes. Similarly, it has been found that the equivalent pharmaceutical application leads to significant erosion in the market share of the original products by promoting generic competition. In addition, it has been observed that, along with the equivalent pharmaceutical application, the original products became more expensive for the consumers and consequently a demand shift towards the generics occurred. The study shows that the original pharmaceutical companies avoid the consequences of the equivalent pharmaceutical practice by decreasing their prices significantly. However direct demand effect of the equivalent pharmaceutical regulation always impedes the indirect price effect and the resulting net effect was the higher generic market share. Another important result was the reduction of the average molecule price by about 30%. According to the authors, the decrease in average molecule prices is an important indicator in terms of saving, considering that the general demand for pharmaceuticals is quite strict. In this context, equivalent pharmaceutical application encourages competition more than direct control of

prices, thus making more discounts in prices and saving more on pharmaceutical expenditures.

3.3. PHARMACEUTICAL EXPENDITURES

The aging population in the world, prolonged human life, socio-economic and ecological changes will increase the need for health services in the coming period. The world population is constantly increasing and the average life expectancy human is prolonged due to the increase in the welfare level.

With increasing world population and rising proportion of aging population in total, the demand for health services is increasing and new needs arise.

The world population, which was 6.3 billion in 2002, is expected to reach to 7.6 billion in 2020, and the number of people aged over 65 and older will increase by 242 million in other words 9.4% of total. Research shows that older people use more pharmaceuticals than young people. 80% of people over 75 years of age use at least 1 prescription and 36% use at least 4 prescription pharmaceuticals.[1] In line with the increasing types and rates of disease, prescription pharmaceutical sales have increased continuously from 2002 to 2018.

Pharmaceutical expenditures are the most important part of the health expenditures. In Turkey, as in all developed and developing countries, the largest buyer of pharma manufactured and sold is the state. For this reason, regulations related to the state pharmaceutical market and expenditures are gaining importance.

As a result of policies aimed at restricting pharmaceutical expenditures, pharmaceutical expenditures only increased by 1.23 times in the period

[1] AİFD, “Türkiye İlaç Sektörü Vizyon 2023 Raporu”, 2012, s.23

between 1995-2010, despite increasing by 1.24 times in the number of pharmaceutical boxes and 2.22 times in the 2002-2010 periods.

The most important applications to slow down the increase in pharmaceutical expenditures can be listed as follows:

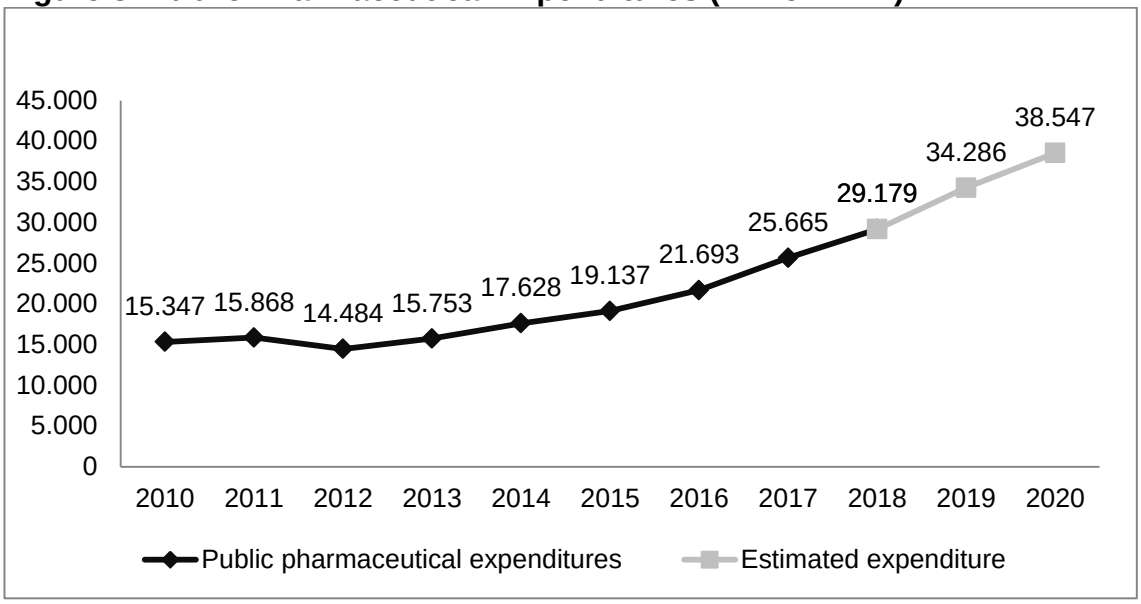
1. Decline up to 80% in pharmaceutical rise by reference price application (2004),
2. To reduce the tax rate to 8% (2005),
3. Establishing the rule that the price of the product will not exceed a defined percentage of the current market price when the generics of the original pharmaceutical are released (2009),
4. For prescribed pharmaceuticals, reimbursement of products up to a certain percentage of the cheapest equivalent pharmaceutical.

By 2020, the world's pharmaceutical market will amount to $ 1.3 trillion. Turkey will to take place within the top 10 actors of this market. The annual pharmaceutical market in Turkey is estimated to grow by 10-15%. In line with mergers and acquisitions among generic pharmaceutical companies in the world, acquisitions and mergers have also increased in the last few years in Turkey. Turkey is a developing economy that is affected by this trend and Turkish market attracts many pharmaceutical companies make investments towards organic growth of their businesses to invest and grow.

3.3.1. Public Pharmaceutical Expenditures

When the ratio of pharmaceutical expenditures in total health expenditures is considered, the share of developed countries is low and this ratio is high in developing countries. For example, this figure is about 26% in Turkey in 2004, which is above the OECD average of 16%. Pharmaceutical expenditures constitute about one fourth of the public health expenditure in Turkey.

Figure 3. Public Pharmaceutical Expenditures (Million TRY)

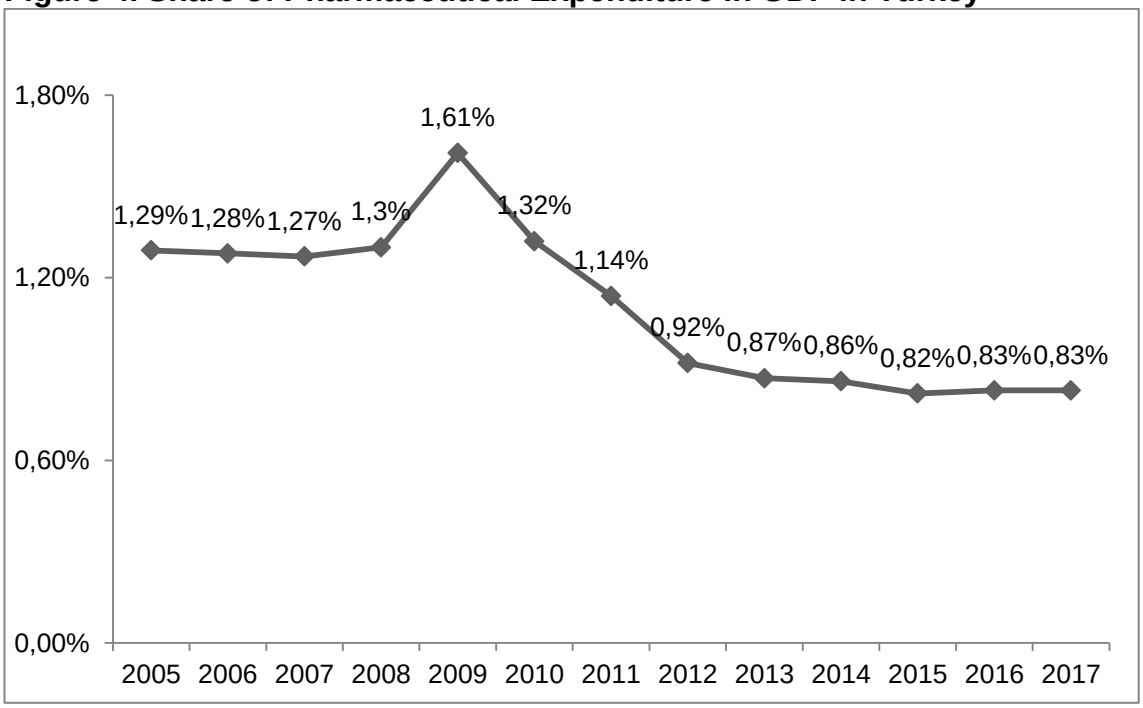


Source: Ministry of Finance, Budget Justification Report

The global crisis, which started in 2008 and increased in severity, severely affected economies as well as Turkish economy. In order to overcome the difficulties of public finances along with the crisis, radical measures were taken in 2009. In this context, global budget implementation was initiated. The fall in pharmaceutical expenditures after 2009 can be attributed to the implementation of Global Budget in pharmaceuticals as of December 2009 in order to keep pharmaceutical expenditures under control. The global budget for public expenditures which is calculated based on pharmaceutical expenditures is determined in order to increase the predictability of the level of public pharmaceutical expenditures. If the expenditures exceed the set budget ceilings, additional measures may be taken with price and discount in order to compensate the excess cost. Within the framework of the Health Transformation Program, increasing health expenditures due to improved service quality and increased access to health were tried to be controlled only with the measures taken for pharmaceutical prices. Pharmaceutical budgets, which are not in line with the service provided, have been determined and the prices of pharmaceuticals have been constantly reduced, to avoid excessive pharmaceutical expenditure. Discount rates applied by Social Security

Institution were increased. The graph below shows the share of public pharmaceutical expenditure in GDP over the years. As seen in the table below, in 2005, pharmaceutical expenditures were 1,29% of GDP and started to increase. After 2009, pharmaceutical expenditure decreased significantly from 1.61 percent to 0.83 percent in 2007.

Figure 4. Share of Pharmaceutical Expenditure in GDP in Turkey

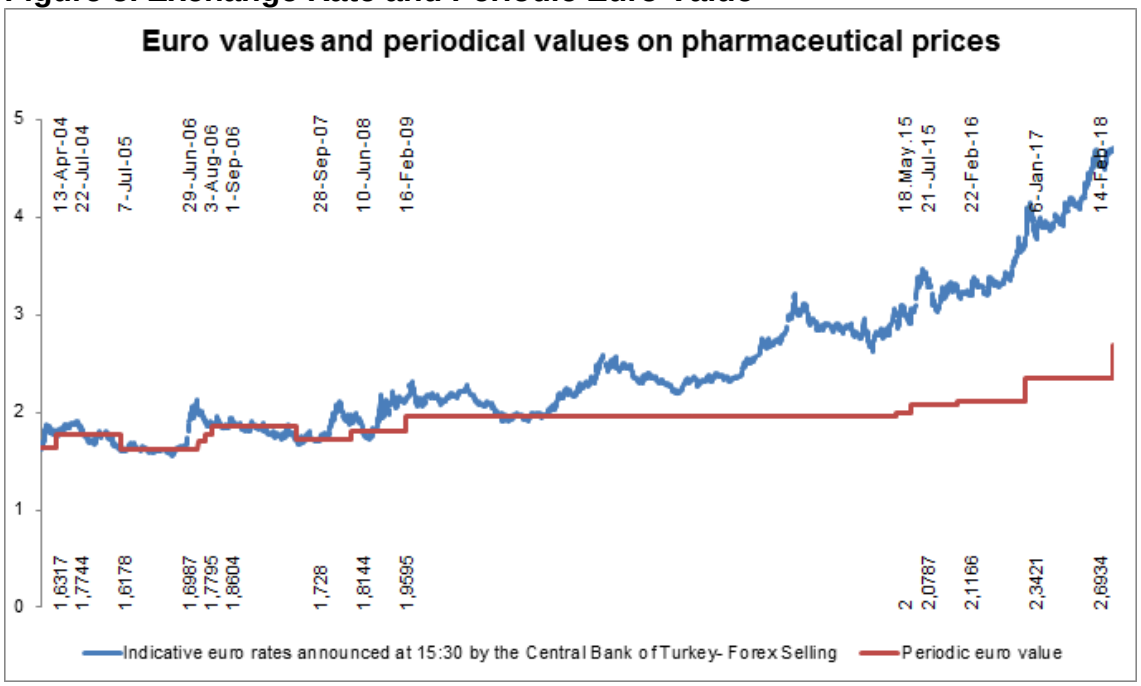


Kaynak: İEİS

To give insight, the most effective item in the reference price application is the Periodic Euro Value application, since 2004. The reference prices are converted into Turkish Lira by using the Periodic TRY/ Euro parity as the original prices are in Euro. In this conversion process, the prices of medicines are determined not by the current value but by a fixed TRY/Euro parity. In the reference (source) price application, the periodic Euro value, which was first used in the determination of pharmaceutical prices in 2004, was determined as equal to 1 Euro equals to 1,6317 TL. Euro value used for the conversion of EU-based pharmaceutical prices to TL was not updated from April 2009 to May 2015 and kept constant at 1,9595 TL in order to control pharmaceutical expenditures. The conversion rate was announced as 2 TL in 2015. This value was updated as

2,3421 TL for 2017. As of 2018, the conversion rate was increased by 15% with a temporary decision and was determined as 2,6934 TL. Currently, the conversion rate is below 50 percent of the spot TRY/Euro exchange rate. In this context, the periodic Euro value is determined based on 70% of the average of the previous year's exchange rate (Indicative exchange rates announced at 15:30 by the Central Bank of Turkey- Forex Selling).

Figure 5. Exchange Rate and Periodic Euro Value



3.3.2. Pharmaceutical Expenditures in OECD Countries

Continuous upward trend in health spending in the world is also seen in the pharmaceutical expenditures. Over the last 20 years, pharmaceutical expenditures have been growing faster than, that of general health care, as observed in almost all OECD countries.[2]

[2] Deloitte "Türkiyede ve Dünyada İlaç Sanayi Gelişme Potansiyelleri", s.10

78% of the world's global pharmaceutical expenditures are made in high-income countries. In addition, the proportion of expenditures for pharmaceuticals is higher in low-income countries per capita.

Rising pharmaceutical expenditures in developing countries in comparison to industrialized countries are explained by various opinions. Due to lack of resources in developing countries, scarce resources can be allocated to preventive health services. As a result, therapeutic health services are given more priority.

Increasing pharmaceutical diversity in the pharmaceutical industry as a result of rapidly-developing technology and dependence on foreign sources, and intensive use of antibiotics are the main factors which are higher responsible for pharmaceutical expenditure in developing countries.

Since the treatment after emergence of diseases is more costly and causes a loss of labor force, more money is allocated to preventive health services in developed countries. Health investments in developed countries are also higher compared to those in less developed countries. Medical supplies, pharmaceutical expenditures and outpatient treatment are in lower amounts in countries that spend more on preventive health care and prioritize health investments. In other words, health spending in developed countries is considered an investment because of the high cost of treatment of diseases; investments were shifted to preventive health services rather than treatment services.

Table 2. Pharmaceutical Expenditure Total, US Dollars/Capita, 2010 – 2016

Country/Year	2010	2011	2012	2013	2014	2015	2016
Australia	564,4	580,9	582,5	626,5	618,7	640	
Austria	525,2	547,8	571,6	585,9	614,4	634,2	631,1
Belgium	623,4	638,6	631	644,3	643,3	676,1	683,6
Canada	780,9	778,2	774	787,8	794,4	811,9	832,8
Czech Republic	391,8	410,5	438,9	431,6	426,4	414,5	432,6
Denmark	360,1	354	340,2	329,1	333,7	338,6	335,2
Estonia	279,9	284	305,6	319,4	331,4	338,8	378,2
Finland	464,7	470,3	476,4	488,8	484,6	496,8	516,1
France	632,8	647,8	636,9	649,4	668,1	655,2	662,7
Germany	659,7	653,9	663,7	691,5	742,3	762	777,5
Greece	771,3	731,2	644,7	603,5	566,8	578,2	594,8
Hungary	539,3	603	561,7	538	545,2	544	565,7
Iceland	534,5	524,4	515,1	504,6	490,9	501	487,6
Ireland	674,3	693,1	729,1	671,4	643	651,3	676,2
Israel	276	286,3	298,8	313,2	314,7		
Italy	588,3	595,5	537,8	549,2	550,8	584,6	607
Japan	656,2	718,3	758,2	793,2	798,2	873,9	
Korea	492,6	499,6	504	497,8	514,5	536	573,1
Latvia	278,7	287,5	294	321,8	350,9	387	451,8
Lithuania	366,2	386,6	448,7	461,2	485,9	500,9	541
Luxembourg	624,2	510,4	527,9	540,2	546	553,1	554,4
Mexico	287	265,8	289,3	284	275,7	282,2	231,8
Netherlands	454,9	461,9	421,5	411,4	403,1	399,2	406
Norway	395,1	436,4	443,6	453,8	461,2	478,9	470,9
Poland	329,1	344	328,9	342	343,4	353,7	369
Portugal	517,2	469	411,5	395,9	399,4	409,9	419
Slovak Republic	569,1	550,4	540	557,3	540,2	544,7	565,6
Slovenia	471,8	483	509,6	526,5	486,7	489,4	507,2
Spain	524,5	518,4	512,3	549,3	549	573,5	621
Sweden	469,9	478,7	496,5	499,2	508,8	520,2	524,4
Switzerland	806,5	856,6	896	939,8	967,7	1.038,5	1.080,4
United Kingdom				461,2	477,6	480,1	475,7
United States	983,8	999,8	996,6	1.014,7	1.114,1	1.196,5	1.208,4

Source: OECD Data https://data.oecd.org/healthres/pharmaceutical-spending.htm

In most OECD countries, the increase in pharmaceutical expenditures exceeded the increase in total health expenditures. In OECD countries, average 60% of pharmaceutical payments are covered by public funds, while the remaining part is paid mainly by out-of-pocket payments and a lesser degree by private insurance.

In this section, the development of pharmaceutical expenditure is examined in the light of reasons and the expected results which lead to an increase in

worldwide pharmaceutical expenditure. The pricing systems in the pharmaceutical sector are listed, rising in pharmaceutical expenditure within the scope and nature of the pharmaceutical market is a line with the increase of previous periods on a world scale.

CHAPTER 4

THE RELATIONSHIP BETWEEN PHARMACECEUTICAL EXPENDITURE AND ECONOMİC GROWTH

4.1. LITERATURE REVIEW

The theory of human capital, developed by Gary Becker and his colleagues, considers education and health as two pillars. This theory has been influential in sharing the view that human capital has an important share in explaining income differences of countries and their differences in economic growth. This fact can be traced back to the work of Adam Smith and Alfred Marshall from a historical perspective.

The theoretical relations between human capital and economic growth are discussed in the framework of Lucas (1988), Romer (1990) and Mankiw et al., (1992). The Mankiw et al. is known as exogenous and the other two are known as endogenous growth model. Mankiw et al. (1992) modified the Solow model by adding an external variable human capital to the production function equation. This model is referred to as the extended Solow model. However, the extended Solow model has simply dealt with human capital as an ordinary and additional input item. Human capital is examined in a model similar to physical capital. The new growth theory made a big leap with Romer (1986), endogenized the sources of growth so that the growth rate could be determined within the model. Romer and Lucas model identified two basic approaches on how to incorporate human capital into economic growth models. In Lucas (1988) model, human capital accumulation is defined as the engine of growth. In addition, the Romer (1990) model focuses on the role of human capital stock to technology for the process of adaptation and innovation.

Sorkin's (1977) study was one of the first studies to analyze the impact of health on economic growth. In the study, life expectancy and infant mortality rate were used as indicators of health. According to him, the decline in infant mortality rate in a country contributes positively to economic growth. However, Sorkin concluded that, despite improvements in the health status of the population in developed countries, it has made little positive contribution to economic growth. According to the results of the analysis, the effect of health on economic growth in developing countries is higher than that of developed countries.

Hansen and King (1996) examined the relationship between per capita health expenditures and GDP per capita in 20 OECD member countries by unit root analysis. According to the results of the study, it was concluded that the series are not stationary and that GDP is an important factor in determining the level of total health expenditures.

Strauss and Thomas (1998) demonstrated the relationship between health and productivity in an empirical study. According to the results of the study, a relationship was found between some health indicators and physical productivity.

Reinhart (1999) analyzed the work of some authors and investigated the effect of life expectancy at birth and government spending on economic growth. The main finding obtained in the study is the existence of a positive relationship between life expectancy at birth and economic growth.

Bhargava et al. (2000) tested the relationship between health and economic growth in developed and developing countries by using data from 1965-1990 periods. In the study, that utilized the panel data analysis method, the data are discussed in five-year periods. According to the empirical findings, a positive but weak relationship was found between economic growth and health.

Sachs (2001) states the contribution of health to development process and economic growth as follows. Most significant economic impact of health is seen on venture capital and human capital according to him. Health itself affects the level of human capital and technology in society, is affected by previous economic policies and institutions, resulting in per capita income and poverty reduction (Sachs, 2001: 26).

Research results from both developed and developing countries prove that economic growth improves health and improvements in health impacts economic efficiency and growth significantly (Atun & Fitzpatrick, 2005: 6).

Bloom et al. (2001) used the Solow model with human capital in their empirical analysis. This study concludes that health capital has a positive effect on economic growth, but this is not statistically significant according to the 2-Stage OLS method. They also conducted the studies on the theory and practice of determining the effects of health on economic growth by using data from the period of 1960-1990. According to the results obtained in the study, health has a positive and statistically significant effect on economic growth.

Some of the empirical literature on the relationship between health and economic growth has focused on OECD countries. Heshmati (2001) analyzed the relationship between GDP per capita health expenditures and GDP in the period of 1970-1992 in OECD countries. In the context of the extended Solow model, the causality relationship between health and economic growth has been investigated. Empirical results suggest that health has a positive impact on economic growth.

Sab and Smith (2001) analyzed the relationship between health and economic growth by using the Pooled OLS method using the data of 1970-1996 periods for 100 countries. According to the empirical findings obtained from the study using life expectancy as a health indicator; It is concluded that health and

education are indispensable for economic growth and health indicator has a positive effect on the output.

Gerdtham and Löthgren (2002) investigated the relationship between per capita health expenditure and economic growth for the 25 OECD member countries using the data from the period of 1960-1997. In the study in which co-integration tests are used, it is understood that health expenditures and economic growth are cointegrated in selected OECD countries.

Ağır and Kar (2003), who explain the relationship between energy capital and economic growth with causality test, concluded that education and health expenditures are closely related with economic growth by using the data of 1926-1994 period.

Gyimah-Brempong and Wilson (2004), using the extended Solow Model, investigated the effect of life expectancy and total health expenditures on income per capita in the period of 1975-1994 for 21 African countries and in the period of 1961-1995 for 23 OECD countries. The authors concluded that the total health expenditure and the life expectancy at birth were positive and strong on per capita income growth.

Bloom et al. (2004), in their study, examined the effect of health on economic growth in the period 1960-1990 by using Panel OLS method for 104 countries. In the study that used life expectancy as a health indicator, they found a positive and statistically significant effect of health on economic growth. The authors emphasized that the positive effect of improvements in life expectancy on the output is relatively high, and that the increase in spending on improving health services is meaningful in terms of better understanding the positive effect on labor productivity.

Gyimah and Wilson (2004) studied the effects of total health expenditures on per capita income growth using the extended Solow model in Africa and OECD countries. They used panel data and dynamic panel estimator in their analysis. While other variables were constant, they showed a positive and strong effect of total health expenditures on per capita income growth.

In their study, Erdil and Yetkiner (2004) analyzed whether there is a causality relationship between health and economic growth in the context of the panel VAR model for the 1990-2000 period in 75 countries with low, medium and high income. Gross domestic product and per capita health expenditure variables were used in the study. As a result of the analysis, a causality relationship was determined from health expenditures to economic growth in high-income countries and from economic growth to health expenditures in low- and middle-income countries.

Dreger and Reimers (2005) investigated the relationship between health and economic growth in the period of 1975-2005 for 21 OECD countries. In the study health expenditures as health indicators, i.e. life expectancy and infant mortality rate were included and, panel co-integration analysis method was used. According to the results, a long-term relationship between health and economic growth was found. In addition, health expenditures alone did not determine economic growth as well as medical advances, life expectancy, infant mortality rates and old age were also found to be decisive.

Bloom and Canning (2005) conducted the studies on the theory and practice of determining the effects of health on micro and macro aspects of economic growth by using data from the period of 1960- 1995. In the study, in which 104 developed and developing countries were examined and panel regression analysis was used, adult survival rate was taken as health indicator. According to the results obtained in the study, it was determined that one point increase in adult survival rates increased labor productivity by 2.8%. Reflection of this to economic growth is positive.

Weill (2006) tried to estimate the effect of health on economic growth with the help of cross-sectional regressions. Empirical findings indicate a statistically significant relationship between two variables. Therefore, this study proves that health is a fundamental determinant of economic growth.

Koying and Young-Hsiang (2006) examined 15 OECD countries within the framework of a regression analysis based on Mankiw et al. (1992). They discussed empirically whether there is a long-term relationship between health expenditures and economic growth. The findings of the study revealed a positive and statistically significant relationship between health expenditures and economic growth.

Kıymaz et al. (2006) examined the relationship between health expenditures and economic growth using the Johansen cointegration analysis for the period between 1984 and 1998 in Turkey, and found that there was a cointegration relationship between private health expenditures and the Gross National Product (GNP). They concluded that there is a one-way causality from GNP per capita to health expenditures.

Ecevit and Çiftci (2008) examined the relationship between health and economic growth using the data of GNP of 1960-2005, life expectancy at birth, infant mortality rate and number of patients per doctor in Turkey. According to the results of the analysis, bi-directional causality relationship between the number of patients per doctor and GNP was determined. In addition, it was concluded that life expectancy and infant mortality rate had no effect on growth.

Beraldo et al. (2009) investigated the effects of public and private health expenditures on GDP for 19 OECD countries in the period of 1971-1998 by using panel data analysis method. According to the results obtained; the public sector health expenditures compared to the private sector have a positive impact on economic growth.

Çalışkan (2009) tried to explain empirically the differences in health expenditures. The study conducted within the scope of OECD countries with the panel data method in the period of 1984-2005, and empirically demonstrated the effects of factors affecting health expenditures and reasons for the differences in health spending among countries.

Narayan et al. (2010) investigated the relationship between health and economic growth in the framework of panel co-integration analysis using data covering 1974-2007. They conclude that there is a long-term co-integration relationship between health and economic growth, and health positively affects economic growth.

Baltagi and Moscone (2010) examined the long-term relationship between variables with panel data analysis by using the per capita health expenditures and GDP data of 20 OECD countries in the period 1971-2004. They concluded that these variables are not stationary and are related to each other in the long term.

Çetin and Ecevit (2010) tested the existence of a long-term relationship between health expenditures and economic growth in 15 OECD countries by using Panel Data Analysis method the period between 1990 and 2006. Although a weak positive relationship between health expenditures and economic growth is detected, they concluded that the relationship is meaningless.

Pradhan (2011) investigated whether there is a long-term relationship between health expenditures and economic growth in the 11 selected OECD countries for the period 1961-2007 and the causality relationship between these variables. This study concluded that there is a short and long term mutual relationship between variables with the Panel Data Analysis method.

Tatoğlu (2011) conducted a Co-integration Test to investigate the existence of short-term and long-term relationships with these variables for the period of 1975-2005 by using GDP per capita and health expenditures data of 20 OECD countries. The findings suggest that every additional investment in the field of health has a growth-enhancing effect in the short and long-run OECD countries.

Sülkü and Caner (2011) examined the long-term relationship between and per capita GDP, per capita health expenditures and population growth rate for the 1984-2006 period in Turkey using cointegration analysis. Sülkü and Caner (2011) concluded that real GDP per capita has a positive relationship with real health expenditures per capita.

As a health indicator, Majdi (2012) investigated the relationship between health and economic growth by using health expenditure per capita and life expectancy at birth. In the study, the period between 1990 and 2008 was covered and panel data analysis method was used. It was concluded that the increase in health expenditures and life expectancy at birth has a positive effect on economic growth.

Elmi and Sadeghi (2012) investigated the relationship between economic growth and health expenditures in developing countries (20 countries) between 1990 and 2009 with co-integration tests and causality analyzes. According to the study, two-way causality relationship was determined between two variables in the long term. In the short term, a causality relation from economic growth to health expenditures was determined, but causality relationship from health expenditures to economic growth could not be determined.

Yardımcıoğlu (2012) investigated the relationship between health variables and economic growth for 25 OECD countries in the period of 1975-2008. According to the results of the study conducted within the framework of cointegration test and causality analysis; in the long term, a positive and mutually significant relationship was found between the variables of health and economic growth. In

the long term, the increase in health expenditure affects economic growth and the increase in economic growth positively affects health. There is a long-term bi-directional causality relationship between health and economic growth.

Georgiou (2013) examined the relationship between health expenditures and economic growth by using data covering 2001-2010 period for selected 17 OECD member countries. Panel data analysis method was used in the study. Total health expenditures (%) ratio in GDP is used as health variable. According to the results, health expenditures in OECD member countries have a positive effect on economic growth.

Selim et al. (2014) discusses the relationship between economic growth and health expenditure component of human capital. The short-term and long-term relationship between per capita health expenditure and economic growth was examined in the context of panel co-integration and error correction models by using 27 EU member countries and Turkey data for the period between 2001 and 2011. According to the findings of the study, there is a positive relationship between health expenditure and economic growth per capita in the short and long term.

Badri and Badri (2016) investigated the relationship between health expenditures and economic growth using data for the period between 2006 and 2013 for selected 24 OECD countries. In the study, panel data analysis method was used, and the gross domestic product and total health expenditure per capita were used as variables. According to the results of the study, health expenditures in selected countries have a significant and positive effect on economic growth. Moreover, an increase of 1% points in health expenditures increases the economic growth by 0.4% points. This shows that health expenditures have an impact on economic growth.

Topallı (2016) examined the relationship between export, human capital and economic growth for Brazil, Argentina, China, Japan, India, South Korea and

Turkey with panel cointegration test and causality analysis for the period between 1995-2013. In the study used health expenditures as a variable of human capital, the causality relationship between variables was analyzed by Emirmahmutoğlu and Köse (2011) and Dumitrescu and Hurlin (2012) causality tests. The results of the panel causality test showed that there is bi-directional causality between economic growth and health expenditures.

Cebeci and Ay (2016) investigated the relationship between health and economic growth by using data from 2000-2014 in their study for BRICS countries (Brazil, Russia, India, China and South Africa) and Turkey. According to the results obtained from the panel data analysis method, health expenditures positively affects growth.

Kılıç et al. (2016), empirically investigated the health-led growth hypothesis i.e. health positively affects economic growth for the period between 1975 and 2013. The bound test approach, autoregressive-distributed lag approach (ARDL) and Kalman filter modeling were used to examine the co-integration relationship between economic growth and health expenditure. They identified co-integration between health expenditure and GDP. The ARDL model show health expenditure positively affects GDP. Also they concluded that health-led growth hypothesis is valid for Turkey.

Saracoglu and Songur (2017) investigated the relationship between per capita health expenditure and per capita income in 10 Eurasian countries including Turkey for the period between 1995 and 2014. Findings from panel cointegration and panel causality tests showed that there is a bi-directional causality between per capita health expenditures and individual national income in the countries studied.

The literature review focuses on the relationship between health and economic growth, as the studies on the relationship between pharmaceutical expenditure and development do not have a significant role in the literature.

Table 3. Panel Data Review on Health and Economic Growth

Author and Year	Countries	Period	Health Variables	Method	Results
Hansen and King (1996)	20 OECD Countries	1960-1987	Health expenditures per person, 15-65 years old population, Public health expenditures	Panel LS	Positive
Bhargava et al. (2000)	107 and 125 countries	1965-1990	Life expectancy at birth Lifespan of adults	Panel Unit Root Test and Chi Square Test	Positive
Bloom et al. (2001)	104 countries	1960- 1990	Life expectancy at birth	Panel Causality Test	Positive
Sab and Smith (2001)	100 countries	1970-1996	Life expectancy at birth Children's survival rate	Panel LS	Positive
Gerdtham and Löthgren (2002)	25 OECD countries	1960-1997	Health expenditures per person	Panel Cointegration Test	Positive
Ağır and Kar (2003),	Turkey	1926-1994	Health and education expenditures	Causality Test	Positive
Bloom et al. (2004)	104 countries	1960-1990	Life expectancy at birth	Panel LS	Positive
Erdil and Yetkiner (2004)	75 countries with low, medium and high income	1990-2000	Health expenditures per capita	Panel VAR Model	Causality health exp. to economic growth in high inc. countries and vice versa in low and middle income countries
Dreger and Reimers (2005)	21 OECD countries	1975-2001	Health expenditures per person, Life expectancy at birth, Infant mortality rate	Panel Cointegration Test	Positive
Bloom and Canning (2005)	104 countries	1960-1995	The survival rate of adults	Panel Regression Analysis	Positive
Koying and Young-Hsiang (2006)	15 OECD countries	1980-1998	Health expenditures	Panel Regression Analysis	Positive
Weill (2006)	80 countries	1960-2000	The survival rate of adults	Panel Regression Analysis	Positive
Kıymaz et al. (2006)	Turkey	1984-1998	Health expenditure	Johansen cointegration	Cointegration and One way causality from GNP to health expenditure

Ecevit and Çiftci (2008)	Turkey	1960-2005	Life expectancy at birth, Infant mortality rate and Number of patients per doctor	Causality Test	Bi-directional causality and No effect
Beraldo et al.(2009)	19 OECD countries	1971-1998	Public health expenditures, Private sector health expenditures	Breusch-Pagan Test and Hausman Test	Positive
Çalışkan (2009)	OECD countries	1984-2005	Per capita health Pharmaceutical expenditure per person	Panel Regression Analysis	Positive
Baltagi and Moscone (2010)	20 OECD countries	1971-2004	Health expenditures per person	Panel Regression Analysis	Positive
Narayan et al. (2010)	5 Asia countries	1974-2007	Health expenditures	Panel Cointegration Test	Positive
Çetin and Ecevit (2010)	15 OECD countries	1990-2006	Health expenditures	Panel Data Analysis	Weak Positive Relationship
Pradhan (2011)	11 OECD countries	1961-2007	Health expenditures	Panel Cointegration Test	Positive
Yerdelen Tatoğlu (2011)	20 OECD countries	1975-2005	Health expenditures per person	Panel FMOSL and DOLS	Positive
Sülkü and Caner (2011)	Turkey	1984-2006	Health expenditures per person	Cointegration analysis	Positive
Elmi and Sadeghi (2012)	20 countries	1990-2009	Health expenditures	Cointegration and Causality Test	Two-way relationship
Yardımcıoğlu (2012)	25 OECD countries	1975-2008	Health expenditures	Cointegration and Causality Test	Positive and Bi-directional causality
Georgiou (2013)	17 OECD countries	2001-2010	(%) Ratio of total health expenditures in GDP	Fixed and Random Effect Panel Regression Model	Positive
Selim et al. (2014)	27 EU countries and Turkey	2001-2011	Health expenditures per person	Panel Cointegration Test	Positive
Badri and Badri (2016)	24 OECD countries	2006-2013	Health expenditures per person	GMM (Generalized Method of Moments)	Positive
Topallı (2016)	7 G20 countries	1995-2013	Health expenditures as a variable of human capital	Panel Cointegration Test and Causality Analysis	Two-way causality
Cebeci and Ay (2016)	BRICS countries and Turkey	2000-2014	Health expenditures	Panel Data Analysis	Two-way causality
Kılıç et al. (2016)	Turkey	1975–2013	Health expenditures	Bound, ARDL Cointeg. Test	Positive

Saraçoglu and Songur (2017)	10 Eurasian countries	1995-2014	Health expenditure per capita	Panel Cointegration and Panel Causality Tests	Two-way relationship

4.2. ECONOMETRIC METHODOLOGY

In the previous section, theoretical and empirical literature focusing on health and economic growth is examined. In this section, an empirical relationship between pharmaceutical expenditures and economic growth is tested. The question of existence of this relationship is analyzed by using panel data method for the period between 1990 and 2016. In this study, pooled time and cross sectional series data are used from 1990 to 2016 for 17 countries. These countries are comprised of OECD countries which are often got as reference to the determination of pharmaceuticals prices. In this analysis, mainly EViews and Stata programs are used.

In this section, panel regression analysis, panel unit root tests, problems encountered in panel regression analysis are introduced theoretically, and the data set and model of the study are presented.

4.2.1. Panel Regression Analysis

In econometric studies, it is seen that often cross-sectional or time series data are used. Time series studies focus on time dimension and cross section size is taken into consideration in cross-sectional studies.

However, since the 2000s, the popularity of panel data studies has started to increase. In panel data studies, both time dimension and section size are considered together.

The cross-sectional data are defined as data consisting of observations made on a number of units, observing the value of the respective variable for each

unit. Panel data, which is a pooled or mixed data type, can be defined as pooling of various observations in horizontal and vertical (time) sections of countries, firms, households or individuals (Baltagi, 2001: 1). This method, which enables the estimation of economic relations by using the repeated section data of the time dimension, is more advantageous in modeling the differences between the units than in the cross-sectional data (Greene, 2003: 284).

Using panel data in econometric analyzes brings significant advantages over other types of data. It is possible to sort these advantages as follows (Baltagi, 2005: 4-6):

- First, panel data sets contain heterogeneous information; thus, the data set and its sections are controlled against heterogeneity. The heterogeneity between the horizontal sections can be explained by the panel data method as well as the dynamic changes of the individuals (Frees, 2004: 1).
- Second, as the panel data analysis is more variable than time series and cross-sectional data analysis, it is less common in this data with multicollinearity problems. Furthermore, because of the relatively large number of observations, the degree of freedom is higher in the models estimated by the panel data and this increases the efficiency. Panel data provide researchers with large volumes of data. The cross-sectional data consisted of the N number (n = 1,..,N) observation. For the time series data, in the case of T number (t = 1,..,T) observation, if the two types of data constitute a panel data, then NxT number of observations occurs.
- Third, the panel data better reflect the dynamics of change.
- Fourth, panel data allow analysis to be performed in the presence of short time series or inadequate individual observation.
- Finally; panel data increases the effectiveness of economic estimators.
- Excluded variables lead to bias in estimation results in studies using time series or cross-sectional data; in case the excluded variables or other

variables do not change according to units or time, the use of panel data enables the deviation to be controlled.

It is observed that panel data regression is estimated in different ways depending on the assumptions made about the constant, slope coefficient and error term. It can be assumed that the constant and the slope coefficient are stable between time and cross sections, and that the error term can capture differences over time and cross-sections. This model is defined as pooled regression model where the data of all units are collected in a pool and the effects of independent variables on the dependent variable are analyzed (Kök and Şimşek, 2009: 4).

It is possible to express the Pooled Regression Model as follows:

$y_{it} = \alpha + \sum_{k=1}^{K} \beta \, \mathcal{X}_{kit} + \varepsilon_{it}$ i=1, 2,……N; t=1, 2,……T

Where “i” is the cross section unit; “t” shows the time. α is constant term; “*β”* denotes the vector of the slope parameters vector in Kx1 size. "$\mathcal{X}_{kit}$" denotes the matrices of (NTxK) dimensional arguments. y_{it} is a vector of dependent variables (NTx1); "ε_{it}" refers to the vector of error terms in the size (NTx1). In such a model, the error term is assumed to be normal with zero mean and "σ_{ε}^{2}" variance. Furthermore, the observations for each cross-sectional unit were not correlated; errors against the unit and time are homoscedastic.

The conventional OLS estimator can be used by ignoring the cross-section and time dimension of pooled data in this most known method for the analysis of panel data. However, in this model, the number of predicted parameters may exceed the number of observations used, so there may be difficulties in estimating the model. To overcome such problems, different models can be derived by making different assumptions about the properties of error terms and the variability of coefficients in panel data analysis. These models, which are

obtained by using different assumptions are defined as a model of constant effects or as a model of random effects.

Models with constant coefficients varying from cross-section to cross-section or over time are defined as Fixed Effects Model. In this model, it can be assumed that fixed effects change from cross-section to cross-section but not changed over time; it can be assumed that constant effects do not change from cross-section to cross-section, but change over time. In both cases, there is a one-way model. If it is assumed that the fixed effects change both between sections and over time, then this is a double-sided model.

In the fixed effects model, the individual-specific effect is a random variable, allowed to correlate with the explanatory variables. In the random effects model, the individual-specific effect is a random variable that is uncorrelated with the explanatory variables. Although the fixed effects model is widely used, a large number of cross-sections may cause loss of degrees of freedom.

Furthermore, another flaw of this model is that it is not suitable for variables that do not change over time. For these reasons, Random Effects Model is recommended. Changes in the cross-section or cross section and period are included in the model as a component of the error term. In this model, random effects vary from cross section to cross section but not changed over time; does not change between cross sections, however, it can be assumed that it changes over time or varies between both cross sections and time. Thus, single and bidirectional models can be examined.

If no section or time effects are considered, then Pooled Regression Model may be preferred. If the section or time effects are considered, then the Fixed Effects Model or the Random Effects Model can be used. It can be said that there is a tendency among the researchers to use the Fixed Effects Model (Gujarati, 2004: 650).

Different definitions can be made as dynamic and static panel models depending on whether or not the delayed data of the dependent variable of the panel data models take place as an independent variable in the model.

The fact that the panel data set contains an equal length time series for each cross section is called a balanced panel. The time series length changes from cross section to cross section is called as unbalanced panel (Wooldridge, 2003: 250).

Panel data models have autocorrelation problems due to time dimension and panel data models have heteroscedasticity problem depending on the cross-sectional size. Depending on the different configurations of the panel data model and the number of observations and the different lengths of the time dimension, the selection of the appropriate one of the GMM, OLS and GLS methods contributes to the elimination problem of not being estimator BLUE (Best Linear Unbiased Estimator).

4.2.1.1. Fixed Effects Model

If the slope is fixed, it is called a fixed effects model. The intercept point varies according to sections, time and both sections and time and the panel data models where the slope and intercept coefficients vary according to units, time and time and both units and time.

If there is a relationship between the error term in the model and the explanatory variables, the Fixed Effects Model is considered as the appropriate model. In this case, FEM estimators are unbiased. In addition, FEM is still the preferable model if the N number is small and the observation number (T) is large.

$$y_{it} = \beta_{1it} + \beta_{2it} X_{2it} + \ldots \beta_{kit} X_{kit} + e_{it} \qquad i = 1,2,\ldots,N \; ; \; t = 1,2,\ldots,T$$

One way to incorporate the change in the model, which is caused by differences between individuals or individuals and time, panel data; will be assuming that the current change leads to a change in some or all of the coefficients of the regression model.

The first way is to use a dummy variable for each individual. This allows each individual to have a different cross-section coefficient, and therefore, a simple least-squares application including all of these puppets will provide protection from the aforementioned deviation.

The general formulation of the model assumes that differences between individuals can be captured by differences in the fixed term. For this purpose, the panel data model is estimated by dummy variable.

Assume that $\beta_{1it} = \beta_1 \; ; \beta_{2it} = \beta_2 \quad ; \beta_{3it} = \beta_3$

Only the fixed term changes above and the fixed term shows differences, not by time, but by cross-section. In other words, although the time dimension is maintaned by the constant, the behavior between individuals varies.

One way to take into account the individuality of each horizontal section is to allow the constant coefficients to be different, while the slope coefficients are the same. This model is the Fixed Effects Model.The term fixed effects comes from the time invariant of the constant of each section but constant is different for each section.

It is assumed that the variance of the error terms in the model is independent and identical to ensure that the variances are equal to zero. In the fixed effects model, the fixed effect estimator predicts different constants for each section and causes the constant coefficient to be different for the section individuals (Baltagi, 2001: 15).

The estimators in fixed effects model are based solely on deviations from the group mean. These are sometimes defined as intra-group estimators (Davidson and MacKinnon, 1993: 76). The fixed effects model has a different constant coefficient for each individual. In the fixed effects model, the parameter variability and the calculation of the group effect are advantageous, while the loss of degree of freedom constitutes a disadvantage. The use of a large number of dummy variables causes loss of freedom and weakens the strength of the test. The biggest advantage of the fixed effects model is that the error terms are correlated with individual effects.

Although the fixed effects model is widely used, a large number of individuals have a loss of freedom. One of the reasons for using the fixed effects model is possibility of failing to incorporate some explainatory variables in the model, such as gender, that do not change over time and the inclusion of dummy variables in the model covers this ignorance. If the dummy variables do not give information about the correct model, then this type of ignorance about the model is tried to be expressed by the error term using the random effects model or the error component model.

4.2.1.2. Random Effects Model

In the case of random effects models, changes in individuals or individuals and time are included in the model as a component of the error term. The main reason for this is to avoid the loss of degree of freedom in fixed-effect models (Baltagi, 1995: 13).

$$y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it}$$

β_{1i} is modeled as a random variable and model as

$$\beta_{1i} = \bar{\beta}_1 + \mu_i$$

$\bar{\beta}_1$ is the mean constant and the unknown parameter. $\mu_{i,}$ is the unobservable incidental errors that take individual differences in individual behavior into account. μ_i is independent of each other and e_{it}.

$$Y_{it} = \left(\bar{\beta}_1 + \mu_i\right) + \beta_2 X_{2it} + ... + \beta_k X_{kit} + e_{it}$$

$$= \bar{\beta}_1 + \sum_{k=2}^{K} \beta_k X_{kit} + \left(e_{it} + \mu_i\right)$$

The expression in this model is the general form of the error component model. The error component expression is due to the term $e_{it} + \mu_i$.

This term consists of two components: e_{it} shows all errors, μ_i show the individual specific error, individual differences, and the change between individuals by keeping the time constant.

$$Y_{it} = \bar{\beta}_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \mu_i + e_{it}$$
$$= \bar{\beta}_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + w_{it}$$

$$w_{it} = \mu_i + e_{it}$$

In the fixed effects model, each cross section has a fixed intercept value. In the case of random effects model, the $\bar{\beta}_1$ constant reflects an average value of all the cross-sectional constants. μ_i error component shows the random deviations of cross section specific constant from the mean value ($\bar{\beta}_1$) whereas, μ_i is an undetectable value.

Briefly, the basic differences between fixed effects models and random effects models are; In fixed effects models, each section has its own fixed term; The constant term in random effects models gives the mean constant term (β) for all cross sectional units, while the error term (μ_i) represents the random deviation of this constant term from each cross-sectional unit. The effective estimation method used to estimate random effects models is the Generalized Least Squares (GLS) method. If the number of sectional individuals (N) in the panel data is high and the time period (T) is shorter than (N), REM provides more effective predictions than fixed effects models. On the other hand, if the number of (T) is large and higher than (N), little difference is expected between the two prediction results and, as mentioned earlier, fixed effects models is more preferred.

However, if the number (T) is low and (N) is greater, a significant difference is expected between the two prediction results. In this case, if the section individuals are taken from a reasonably large sample randomly, fixed effects models are considered more suitable for the analyses.

The determination of fixed effects and random effects models is decided by Hausman test. If the individual effects are determined in the LM test, and the Hausman test finds that these individual effects are unrelated to the other variables in the model, the model of random effects is consistent and effective. In this case, the fixed effects model is consistent but not effective. On the other hand, if individual effects are associated with explanatory variables, the model of fixed effects is consistent and effective. However, the model of random effects is inconsistent (Greene, 2003: 36).

4.2.2. Random Effects Test (Hausman Test)

The test checks whether the difference between the fixed effects model parameter estimators and the random effects model parameter estimators, namely the difference between the slope coefficients of the random effects and

fixed effects model is statistically significant(Greene, 2003: 302 and Wooldridge, 2002: 288).

In other words, the Hausman test tests the correlation between the specific effects of the model and the explanatory variables of the model assuming that the specific effect of the group is random (Hausman, 1978: 1251-1271).

Hausman statistics; uses the difference between constant effective and random effective model coefficient estimates. For this purpose, fixed and random effective models are estimated. The following formula is used to calculate the coefficients of the fixed effects model by the OLS method.

$$\beta_{EKK}=\left[\sum_{i=1}^{N}\sum_{t=1}^{T}\left(x_{it}-\overline{x_i}\right)\left(x_{it}-\overline{x_i}\right)^{t}\right]^{-1}\sum_{i=1}^{N}\sum_{t=1}^{T}\left(x_{it}-\overline{x_i}\right)\left(y_{it}-\overline{y_i}\right)$$

The coefficients of the random effects model are estimated by the GEKK method with the following formula.

$$\beta_{GEKK}=\left[\frac{1}{T}\sum_{i=1}^{N}\left(x_i'\cdot x_i\right)+\psi\sum_{i=1}^{N}\left(\overline{x_i}-\overline{x}\right)\left(\overline{x_i}-\overline{x}\right)'\right]^{-1}\left[\frac{1}{T}\sum_{i=1}^{N}\left(x_1'\cdot y_i\right)+\psi\sum_{i=1}^{N}\left(\overline{x_i}-\overline{x}\right)\left(\overline{y_i}-\overline{y}\right)\right]$$

Difference between parameter estimates

$$\hat{q}=\beta_{EKK}-\beta_{GEKK}$$

Difference between covariance matrices of parameter estimations

$$Var\left(\hat{q}\right)=Var\left(\beta_{EKK}\right)-Var\left(\beta_{GEKK}\right)$$

Hausman test statistic is calculated as follows:

$$m=\hat{q}Var\left(\hat{q}\right)^{-1}\hat{q}$$

In cases where the number of units is constant and time converges to infinity, that is, when N is smaller than T, the coefficient estimations of the fixed effects model (β OLS) and the coefficient estimations of the random effects model (β GLS) are close to each other. In this case, a fixed effects model may be preferred.

4.2.3. Panel Unit Root Test

Unit root tests are generally used in time series analysis among applied researchers. However, unit root tests attracted attention in panel data analysis later.

It is possible to examine the unit root tests used in panel data studies in two parts. In the first group, Im, Peseran, Shin (2003) and Fisher-oriented tests (such as ADF and PP tests) are called individual unit root tests.

Levin, Lin, Chu (2002); Breitung (2000) and Hadri (2000) unit root tests are referred to as common unit root tests. In this study, Im, Peseran, Shin (2003) and Fisher ADF unit root tests were used.

The Im, Peseran, Shin (2003) test is based on a broad regression equation that includes trend and fixed terms as follows:

$$\Delta y_{it} = \mu_i + \beta_i y_{i,t-1} + \sum_{k=1}^{p_i} \theta_{i,k} \Delta y_{i,t-k} + \gamma_i t + \varepsilon_{it}$$

When the trend is extracted from this equation, the fixed model is obtained.

Where i = 1, 2, …, N and t = 1, 2, ..., T. In this test, the null hypothesis is set as βi = 0 for all “i” (section individuals), while the alternative hypothesis is βi < 0 for at least one “i”. If the null hypothesis is rejected, it is concluded that at least one

or more of the series is stationary. The critical values required for this test are taken from the values of Im, Pesaran, Shin (2003).

Im, Pesaran, Shin (2003) first calculates t statistic in the form $t_i = \hat{\beta}_i / sh(\hat{\beta}_i)$ of for each cross section individual. Secondly, by taking the averages of t_i, the $\overline{Z}$ statistics are found as follows:

$$\overline{Z} = \left(\frac{\sqrt{N}(\bar{t} - E(\bar{t}))}{Var(\bar{t})} \right) \sim N(0,1)$$

it obtained in the form $\bar{t} = \frac{1}{N}\left(\sum_{i=1}^{N} t_i \right)$

In order for a time series to be stationary, its average and variance should not change over time and its covariance between the two periods should be dependent on the distance between the two periods rather than the period when this covariance is calculated (Gujarati, 1999).

The results obtained do not reflect the true relationship because of the problem of spurious regression in the models estimated by non-stationary time series (Granger and Newbold, 1974). In such a case, the results of the test results t and F lose their validity. Therefore, regression analysis with non-stationary time series can be meaningful and reflect the real relationships, but it is only possible to have a cointegration relationship between these time series (Gujarati, 1999).

The Dickey-Fuller (DF) test is based on three regression equations:
Exogenous variables: None

$$\Delta Y_t = \gamma Y_{t-1} + u_t$$

Exogenous variables: Individual effects

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + u_t$$

Exogenous variables: Individual effects, individual linear trends

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + u_t$$

If the error term is serial correlated, the regression model will be used is as follows:

$$\Delta Y = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \beta_i \sum_{i=1}^{m} \Delta Y_{t-i} + u_t$$

If the DF test is applied to this model, this is called the Augmented Dickey Fuller (ADF).

4.2.4. Estimation of Fixed Effects Model with OLS and GLS

A model with a homogeneous and normal distribution of the residuals can be estimated by the OLS method. If there is a heteroscedasticity effect on the dependent variable, it is not appropriate to use the OLS for fixed-effect model estimates. Variable variance models are usually predicted by GLS. GLS corrects heteroscedasticity and autocorrelation problem (Zupi, 2003: 40).

4.2.5. Autocorrelation Problem and Testing in Panel Data Models

Autocorrelation can be observed from one time period to another in panel data sets. If the model has autocorrelation, a combination of White and Newey-West estimators can be used as a correction weight to analyze the varying variance and autocorrelation in the model.

$$y_{it} = \mathbf{x}_{it}^{'}\boldsymbol{\beta} + u_i + v_{it},\ v_{it} = \begin{cases} \rho v_{it-1} + e_{it} \\ \rho_i v_{it-1} + e_{it} \end{cases}$$

If the model has autocorrelation, it is important to solve them. There are several tests to find out autocorrelation of residuals. In the balanced panel data, the

Durbin-Watson test tests the first order autocorrelation in residuals. Baltagi and Wu (1999) rearranged the DW test for balanced panel data. Alternatively, autoregression on the delays of residuals may give information about the presence or absence of autocorrelation. Parks methods are also used to solve autocorrelation in random errors.

In the autocorrelation test, the significance of the coefficient obtained as a result of regression of the model residuals with a period lag value is tested. D-W test statistic is used for autocorrelation testing.

4.2.6. Heteroscedasticity Problem and Testing in Panel Data Models

The high differences between the groups in the panel data models create a heteroscedasticity problem. Different error variances are possible for different shares. If there is heteroscedasticity from the cross section data, the estimators are consistent but biased.

$$y_{it} = \mathbf{x}_{it}^{'}\boldsymbol{\beta} + u_i + e_{it}, Var(u_i) = \sigma_{u_i}^2, Var(e_{it}) = \begin{cases} \sigma_{e_{it}}^2 \\ \sigma_{e_i}^2 \end{cases}$$

In panel models, if there is a cross section heteroscedasticity problem, Beck and Katz recommend the Panel Corrected Standards Errors (PCSE) method (Beck, Katz and Tucker, 1998: 1269). The Breusch-Pagan Lagrange Multiplier statistics are used for the cross-sectional residual correlation, which supports the use of SUR rather than the unrestricted OLS. It tests the existence of simultaneous correlation in the cross-sectional data.

4.2.7. Vector Autoregression in Panel Data Models

The panel VAR approach is the traditional VAR method adapted to the panel data set. The panel VAR method is based on the analysis of all externally

accepted variables in the system using the panel data set. VAR analysis shows how affect each other, and act together.

The VAR model is known as a model that considers all selected economic sizes as a whole. The determination of the model depends on the fulfillment of certain conditions. Sims has developed the vector autoregression (VAR) model, where all variables are considered endogenous. The vector term comes from handling of a vector that consists of two or more variables; the term autoregression also comes from the lagged values of the dependent variable to the right of the equation (Tari, 2015: 451). The VAR model is heavily preferred in the studies on applied econometrics, especially in macroeconomics and finance after Sims' pioneering work. The VAR model emerged as a simple multidimensional time series estimation model defined by all variables involved in the model covering the lagged values of itself and other variables. It is a estimation model, but it also provides structural analysis.

Ashley and Verbrugge show that the VAR analysis provides impulse response function for even non-stationary and non-cointegrating variables. They are robust to these specification issues.

A simple VAR model for two variables such as Y and X;

$$Y_t = \alpha_{10} + \sum_{i=1}^{p} \alpha_{11i} Y_{t-i} + \sum_{i=1}^{p} \alpha_{12i} X_{t-i} + u_{1t}$$

$$X_t = \alpha_{20} + \sum_{i=1}^{p} \alpha_{21i} Y_{t-i} + \sum_{i=1}^{p} \alpha_{22i} X_{t-i} + u_{2t}$$

4.3. THE MODEL AND DATA SET

4.3.1. The Model

Empirical studies are carried out by panel data analysis in order to evaluate the relationship between pharmaceutical expenditure and economic growth with the formation of pharmaceutical prices. This also shows us the impact of pharmaceutical expenditure on economic growth. In this panel data analysis, where human development index of development indicators is a dependent variable, pharmaceutical expenditure is included as an independent variable. In addition, other independent variables such as school enrollment rate, unemployment, capital stock, foreign direct investments which may affect economic growth are also included in the model. As previously stated, in this study, pooled time and cross sectional series data are used from 1970 to 2016 for 17 countries. These countries are comprised of OECD countries, in which countries are often got as reference to the determination of pharmaceuticals prices. In this context, the regression model is specified as follows:

$$HDI_{it} = \alpha_i + \beta_1 PHARSPE_{it} + \beta_2 SCHENR_{it} + \beta_3 UNEMP_{it} + \beta_4 CAPST_{it} + \beta_5 FDI_{it} + \varepsilon_{it}$$

Where HDI (human development index) represents economic growth, i and t represent county and period. $PHARSPE$ is total pharmaceutical expenditure as a percentage of health spending, and $SCHOOLENR$ is primary school enrolment as a percentage of gross. $UNEMP$ represents the percentage of the total unemployment of total labor force (modeled ILO estimate). $CAPST$ represents the capital stock from investment data on an asset basis. FDI represents foreign direct investment as a net inflows percentage of GDP. ε_{it} is the error term.

4.3.2. Data and variables

The data are provided by the World Bank, the OECD and the United Nations Development Program and SSI's.

The Human Development Index (HDI) dependent variable is defined in the previous section.

HDI is considered as an indicator for the development level of a country. The human development index reflects the combination of many indicators and data. As it uses more than one economic social and human indicator, it has an effective power to measure development and real economic growth. The consideration of HDI in policy preferences contributes to the evaluation of the policy. The HDI can be considered as a summary of human development. Healthy and long life, informed individuals and society, economic good life are the elements of this development. The geometric average of these three elements and the Human Development Index are found.

The expected life expectancy at birth as a health dimension, the years of schooling as the education dimension and the duration of the expected years of schooling for children entering the school are used. Good life size is measured by gross national income per capita. The income logarithm is used because of the decreasing importance of revenue growth on the HDI. It cannot be said that HDI fully reflects development. It requires analysis of other indicators and information for this.[3]

Pharmaceutical expenditures generally include prescription pharmaceuticals and pharmaceutical expenditure for called OTC products. In some countries, some goods that are not medical resistant are also included in this expenditure. Pharmaceuticals consumed in hospitals and other health care facilities were excluded. The last expenditure on pharmaceuticals includes wholesale and retail sales margins and value-added tax. Total pharmaceutical expenditure means net spending in most countries. This indicator is measured as the share

[3] http://hdr.undp.org/en/content/human-development-index-hdi, UNITED NATIONS DEVELOPMENT PROGRAMME Human Development Reports

of total health expenditure in USD per capita (using PPPs across the economy) and the share of GDP.[4]

> "Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music."[5]

Gross enrollment rates indicate the capacity to register in the education system, but the high enrollment rate may not indicate a successful education system. Therefore, the enrollment rate may reflect a considerable number of children in each class due to grade repetition or late entry. This shows the relevance of development.

Unemployment shows the share of the unemployed who are looking for work in the job-seeking labor force. [6] Unemployment affects national development. Unemployed people can contribute little to economic growth and have fewer opportunities to exercise their rights as citizens. Expenditure, savings and investments are limited compared to other individuals.

Unemployment is very important in demonstrating the status of a country to achieve sustainable and inclusive economic growth, full and efficient employment and the Sustainable Development Goal.

The capital stock variable is generated on the basis of assets from investment data. Both theoretical approaches and empirical studies reveal that one of the most critical elements of economic growth is the accumulation of capital. Capital accumulation, which is one of the most basic indicators of the ability to produce

[4] OECD (2019), Pharmaceutical spending (indicator). doi: 10.1787/998febf6-en
[5] https://data.worldbank.org/indicator/SE.PRM.ENRR?view=chart, UNESCO Institute for Statistics and World Bank
[6] International Labour Organization, ILOSTAT database. Data retrieved in September 2018. And World Bank.

goods and services in a certain period, is one of the main elements of increasing employment and increasing productivity and thus increasing the welfare of countries. In this framework, it is of great importance to examine the level of capital accumulation and its development over time in terms of its impact on development.

Capital stock includes elements used in the production process such as buildings, machinery and equipment for many years. In addition to these factors, infrastructure investments such as roads, dams, and residential investments considered as physical investments are included in the capital stock at the country level. Sometimes capital accumulation is considered as the value of physical assets used in the production process, but also includes non-physical assets such as education, health, research and development expenditures. However, the aggregation of non-physical assets and physical assets, as well as measurement problems related to a number of non-physical assets, prevent a comprehensive capital accumulation estimate.

Capital stock at constant national prices for asset[7] a: K_{at} = (1 − δ_{at})−1 + I_{at}

> "Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP." [8]

Private finance flows, equity and debt are the major parts of development financing. This shows the relevance of development. Equity flows include

[7] The Database | Penn World Table | Productivity | University of Groningen https://www.rug.nl/ggdc/docs/user_guide_to_pwt90_data_files.pdf

[8] International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates.

foreign direct investment (FDI) and portfolio equity. Debt flows are financing provided through bond issuance, bank loans and supplier loans.

4.4. RESULTS

4.4.1. Panel Regression Analysis

The basic descriptive statistics of the dependent and independent variables used in the panel data analysis are given below before the regression results**.**

Table 4. Descriptive Statistics

	HDI	PHARSPE	SCHENR	UNEMP	CAPST	FDI
Mean	0.843227	17184.25	102.0030	7.870758	3849262.	5.785934
Median	0.856000	16305.00	101.5593	7.380000	1801478.	1.846783
Maximum	0.951000	31628.00	124.8505	27.47000	15484083	252.3081
Minimum	0.579000	7490.000	78.81160	1.480000	29706.76	-58.32288
Std. Dev.	0.065844	5448.107	5.571211	4.462315	4070602.	16.10298
Skewness	-1.285824	0.472803	1.262441	1.728446	1.271386	8.849493
Kurtosis	5.353456	2.568457	7.640579	7.115062	3.382651	124.9701
Jarque-Bera	232.4094	20.66269	533.7787	531.9439	126.4566	290508.2
Probability	0.000000	0.000033	0.000000	0.000000	0.000000	0.000000
Sum	387.0410	7887571.	46819.37	3478.875	1.77E+09	2655.744
Sum Sq. Dev.	1.985646	1.36E+10	14215.58	8781.304	7.59E+15	118762.1
Observations	459	459	459	442	459	459

The results of the Im, Pesaran, Shin W-stat and ADF - Fisher Chi-square unit root tests used in the analysis of the stationary of each series are presented in table 5. In the analysis, two models were used: Individual effects and individual effects, individual linear trends. According to the empirical results; H0 hypothesis is rejected in both models for the variables. Delay values for variables are automatically determined according to the Akaike Information Criteria (AIC).

Table 5. The results of the Im, Pesaran, Shin W-stat and ADF - Fisher Chi - Square Unit Root Test

	Exogenous variables	Method				Result
		Im, Pesaran and Shin W-stat		ADF - Fisher Chi-square		
		Statistic	Prob.	Statistic	Prob.	
HDI	Individual effects	-4.47577	0.0000	106.860	0.0000	I(0)
	Individual effects, individual linear trends	-2.14884	0.0158*	49.3678	0.0429	I(0)
PHARSPE	Individual effects	-1.66426	0.0480	53.0344	0.0198	I(0)
	Individual effects, individual linear trends	-1.99849	0.0228	100.276	0.0000	I(0)
SCHOOLENR	Individual effects	-4.39839	0.0000	91.8542	0.0000	I(0)
	Individual effects, individual linear trends	-1.74909	0.0401	67.0750	0.0006	I(0)
UNEMP	Individual effects	-3.11727	0.0009	63.4442	0.0016	I(0)
	Individual effects, individual linear trends	-2.08001	0.0188	51.4934	0.0277	I(0)
CAPST	Individual effects	7.21742	1.0000	21.2335	0.9569	I(1)
	Individual effects, individual linear trends	0.54728	0.7079	46.5927	0.0736	I(1)
FDI	Individual effects	-5.95016	0.0000	97.8076	0.0000	I(0)
	Individual effects, individual linear trends	-3.83919	0.0001	75.7191	0.0001	I(0)

*Levin, Lin & Chu t test. Majority of tests showed that this variable was stationary.

When the results of unit root tests are evaluated in general, it is understood that all the variables except capital stock included in the analysis are stationary. In other words variables are stationary degree I(0). Capital stock variable is stationary degree I(1). Therefore, first difference for this variable was used in redesign model.

$$HDI_{it} = \alpha_i + \beta_1 PHARSPE_{it} + \beta_2 SCHENR_{it} + \beta_3 UNEMP_{it} + \beta_4 DCAPST_{it} + \beta_5 FDI_{it} + \varepsilon_{it}$$

Table 6 gives the results of Pooled Regression Model Panel OLS estimation for fixed effects model.

Table 6. Fixed Effects Model Results (Panel Least Squares)

Dependent Variable: HDI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.782391	0.059925	13.05623	0.0000
PHARSPE	-2.66E-06	7.75E-07	-3.433182	0.0007
SCHENR	0.000732	0.000571	1.281911	0.2006
UNEMP	0.002493	0.000720	3.461806	0.0006
DCAPST	1.60E-07	4.96E-08	3.222843	0.0014
FDI	0.000307	0.000140	2.200624	0.0283

Cross-section fixed (dummy variables)

R-squared	0.654478	Durbin-Watson stat	0.066202
Adjusted R-squared	0.637202		
F-statistic	37.88344		
Prob(F-statistic)	0.000000		

After the fixed effects model, estimation is made by the random effects model. Firstly models are formed and the relations between variables are examined with the Least Squares (OLS), Constant Effects (SE) and Random Effects (RE) models. The relationships between variables with effects (SE) and Random Effects (RE) models are examined.

Table 7. Random Effects Model Results (Panel EGLS Cross-section random effects)

Dependent Variable: HDI				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.827500	0.057750	14.32890	0.0000
PHARSPE	-3.75E-06	7.11E-07	-5.269080	0.0000
SCHENR	0.000567	0.000549	1.032261	0.3025
UNEMP	0.001839	0.000675	2.724936	0.0067
DCAPST	1.07E-07	4.45E-08	2.395437	0.0170
FDI	0.000314	0.000138	2.275398	0.0234

		S.D.	Rho
Cross-section random		0.035517	0.4566
Idiosyncratic random		0.038744	0.5434
Weighted Statistics			
R-squared	0.087636	Durbin-Watson stat	0.067598
Adjusted R-squared	0.077173		
F-statistic	8.375837		
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.214203	Mean dependent var	0.846095
Sum squared resid	1.433826	Durbin-Watson stat	0.031601

After examining the SE and RE models in which time and unit effects are reflected by variables, Hausman test was applied to determine which of the fixed effects and random effects models were more appropriate.

Table 8. Correlated Random Effects - Hausman Test (Cross-Section Random Effects Test)

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		15.531417	5	0.0083
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
PHARSPE	-0.000003	-0.000004	0.000000	0.0004
SCHENR	0.000732	0.000567	0.000000	0.2901
UNEMP	0.002493	0.001839	0.000000	0.0093
DCAPST	0.000000	0.000000	0.000000	0.0152
FDI	0.000307	0.000314	0.000000	0.7305

Hausman test was performed according to H_0: Random effects model and H_1: Fixed effects model hypothesis. As a result of the Hausman test, the probability value of the hypothesis is below 0.05, as shown in table 8. Therefore hypothesis H_0 is rejected, alternative hypothesis H_1 is accepted. For our model, the fixed effects model is appropriate and preferred.

Before evaluating the results, it is necessary to analyze whether the model has autocorrelation and changing variance problems. In the fixed effects model, the Durbin Watson test indicates autocorrelation. The standard errors of the model need to be corrected when autocorrelation and heteroscedasticity problems are encountered with the tests.

There are various robust methods available for computing the coefficient standard errors. In the study, model prediction is corrected by the GLS weight, cross-section SUR (Seemingly Unrelated Regressions) panel method. The Cross-section SUR setting allows for contemporaneous correlation between cross-sections (clustering by period). A feasible GLS specification correcting is estimated for both cross-section heteroscedasticity and contemporaneous correlation.

Table 9. Corrected Model (Robust Method) - Panel EGLS Specification

Dependent Variable: HDI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.789401	0.004646	169.9190	0.0000
PHARSPE	-2.47E-06	6.89E-08	-35.79890	0.0000
SCHENR	0.000646	4.18E-05	15.44977	0.0000
UNEMP	0.002395	5.71E-05	41.95684	0.0000
DCAPST	1.54E-07	2.67E-09	57.64638	0.0000
FDI	0.000243	2.29E-05	10.60363	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.997641	Durbin-Watson stat	1.576858
Adjusted R-squared	0.997523	S.E. of regression	1.003253
F-statistic	8458.238		
Prob(F-statistic)	0.000000		

According to the adjusted results in table 9, pharmaceutical expenditure does not have a positive effect on economic growth. On the other hand, it is concluded that economic growth with other explanatory variables moves in the same direction. School enrollment rate positively affects economic growth. Capital stock positively affects economic growth. Foreign direct investments also have a positive impact on economic growth. However, the unemployment rate and economic growth also seem to move in the same direction.

All results in fixed effect model and robust model appear statistically significant. When the effects of independent variables are evaluated, the ratio of pharmaceutical expenditures in health expenditures and capital stock are higher than the other variables.

Paradoxically, high unemployment rates may take place in countries have high economic growth and low poverty rates while low unemployment rates may conceal the major poverty of a country. In countries where employment or welfare is not high, people work to make a living in insecure job. In developed countries, employees can wait for appropriate or desired work. On the other hand, the decision to employ a person in a developed country is more difficult

than in developing countries.[9](Detail of this analysis could see “SDG Indicator 8.5.2”)

As a result in fixed effect model and robust model, the analysis and model are statistically significant and do not have a specification error. The results obtained are fully compatible with the content of the thesis and the theoretical knowledge.

4.4.2. Vector Autoregression in Panel Data Models

As we focus on revealing the relationship and causality between pharmaceutical expenditures and economic growth, panel vector autoregression analysis is also made in addition.

Firstly, lag order selection statistics for panel VAR should be determined. Model selection calculated for first to third order panel VAR s by the first four lags of human development index (hdi) and pharmaceutical expenditures (phaspe) as instruments. The test result for calculating the model selection measurement appears in table 10 in appendix 1.

As mentioned above, it is necessary to determine an appropriate lag length for the VAR model to be applied. There are many criteria in the literature to determine the delay length. Andrews and Lu (2001) lead that first-order panel VAR is the preferred model for the three model selection criteria since the smallest MBIC, MAIC and MQIC. First-order panel VAR model is implemented with the same specification of instruments as above with GMM estimation based on the selection criteria.

The relationship between pharmaceutical expenditures and economic growth at 5 percent significance level is obtained from the results in table 11 in appendix

[9] https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?view=chart, International Labour Organization, ILOSTAT database. Data retrieved in April 2019.

1. And pharmaceutical expenditures do not affect economic growth positively. These results also can be provided by Granger causality wald test.

As can be seen in table 12 in appendix 1, Granger causality test show that pharmaceutical expenditures Granger causes economic growth. It also shows that economic growth Granger causes pharmaceutical expenditures at the usual confidence levels.

Estimates of panel vector autoregression model are rarely interpreted by itself. In practice, researchers generally investigate the exogenous changes impact in each endogenous variable to other variables in the panel VAR model.

After estimating the VAR model, it is necessary to test whether the predicted model shows a stability structure. The stability of the model depends on the eigenvalues of the coefficient matrix. If all of the eigenvalues of the coefficient matrix are in the unit circle, the system is stable; at least one of the eigenvalues is reached on the unit circle or out of the system (Mucuk and Alptekin, 2008: 168). In table 13 and figure 6 in appendix 1 show that all the eigenvalues lie inside the unit circle. Panel vector autoregression model satisfies stability condition. The resulting table and graph confirms that the estimate is stable.

The variance decomposition investigates what percentage of a change in one of the variables is caused by itself and other variables as shown in table 14 and figure 7 in appendix 1.

There is negative relationship between economic growth and pharmaceutical expenditures based on the FEVD estimates. While the impact of pharmaceutical expenditures on economic growth is weak, economic growth has a higher impact on pharmaceutical expenditures. The effect of pharmaceutical expenditures on economic growth is increasing in the following periods. Similarly, the effect of economic growth on pharmaceutical expenditures is

increasing in the following periods. Economic growth explains 2 percent of variation in pharmaceutical expenditures initial period and explains 40 percent of variation in pharmaceutical expenditures in future period. About 2 percent of economic growth in the model can be explained by pharmaceutical expenditures. Pharmaceutical expenditures explain only four percent of variation in future economic growth in the model.

CONCLUSION

Human capital is expressed as the sum of the knowledge, skills and abilities of the labor force involved in the production process. It emerges through investments in education, health and brain drain. Education element is used more by economists in human capital theories since education investments are more effective on human capital than other elements and education variables are easier to measure compared to other related factors.

Human capital investments are complementary. Human capital contributes to the production of new technologies and increases the productivity of the workforce employed in production and thus economic growth. The increase in the economic growth of a country will raise the number of qualified labor force by increasing the investments in human capital in the country.

The theoretical foundations of the relationship between human capital and economic growth coincide with the post-World War II. The reason behind the fact that human capital is an important issue in economic growth theories is that some countries achieve critical advances with their qualified labor force and thus, widen the development gap with others.

Many theoretical debates on growth and development literature focus on the role of human capital in the process of economic growth. There is an emphasis not only on the fact of education but also on all human capital investments that improve people's abilities. In this context, the positive effects of health expenditures on human capital and also effects of human capital on the economic growth have been demonstrated by previous studies.

Empirical studies regarding the impact of human capital on economic growth have indicated the need to include human capital as a factor of production. Empirical studies on human capital theories claim that human capital has a

significant impact on economic growth. Human capital is examined within the context of exogenous and endogenous growth theories. Therefore, human capital is added to analyses both as a separate production factor and as a factor enabling sustainable economic growth by increasing the efficiency of other factors and technology.

In addition to the education element, the health element is evaluated in the thesis within the scope of human capital. The element of health is addressed in terms of pharmaceutical prices and expenditures. The relationship between pharmaceutical expenditures and economic growth, which is not usually included in empirical studies, is revealed in this context.

Even though individuals form the demand side in the pharmaceutical market, the state authority, which is the main actor in the social security system and carries out public duties such as licensing, reimbursement, pricing, determines this demand. Struggle of firms against different pricing systems emerges after significant R & D and production investments, regulatory procedures and complex legislative structures in the process of release of medicines. The greatest impact of this struggle is reflected on pharmaceutical expenditure.

Pharmaceuticals have become indispensable elements for human life. This status of pharmaceuticals has led to an increase in demand for pharmaceuticals. Inefficient competition conditions, such as the need for very high investments in pharmaceutical production, patent protections, and the difficulties of new firms entering the market, can prevent the pharmaceuticals from being accessible at reasonable costs at all times. This access barrier consists of the factors caused by the seller. The preventive factors encountered by the buyer are also different from other markets. Although the ultimate pharmaceutical demanders are patients, public authorities have an interventionist role in many countries due to their social state approach and social security systems. Therefore, government that has a role for spending, licensing of medicines, reimbursing the majority of pharmaceutical payments

under the scope of the social security system and determining the prices of medicines constitutes the main demand side. Considering the competing interest of market players, there may be disruptions in spending, determining pharmaceutical prices, determining demand and supply, and making profit and benefit maximization decisions.

Unlike other markets, the disruptions and shortcomings are not only limited to the deviation of profit and benefit maximizations, but also most importantly pose vital risks to sustainability of health conditions of the population.

When complex legislative structures and pharmaceutical market regulation systems are combined with oligopolistic pharmaceutical market, problems may arise in pharmaceutical expenditure, determining pharmaceutical prices, excessive demand or shortage of supply may be experienced. These situations may cause ineffective pharmaceutical expenditure, deviation of profit and benefit maximizations and most importantly life-threatening risks by limiting patients' access to the pharmaceutical.

Therefore, authorities in many countries intensely regulate their pharmaceutical sectors. Regulations aim to increase the access of the patients to the pharmaceutical, to ensure the production of advanced pharmaceuticals and to minimize the payments by the government during the functioning of social security system.

In practice, it can be observed that the regulations and interventions do not fully achieve intended, also it can be concluded that the market actors cannot comply with all regulations. The results may not serve the purpose of the regulations and the patients cannot satisfy their needs at the demand side.

There are many studies on the positive effect of health and health expenditures on economic growth under the scope of human capital. However, due to limited

studies that investigate the relationship between pharmaceutical expenditure and economic growth, this thesis analyzed and empirically examined this specific relationship. The pharmaceutical expenditures and the empirical work done are closely related. The effect of pharmaceutical expenditures on health expenditures and the relationship between health expenditures and economic growth under the scope of human capital, as set forth in the studies, emerge an idea that pharmaceutical expenditures affect the economic growth in the same direction as health expenditures. Otherwise, it may indicate a problem about pharmaceutical expenditures, pharmaceutical prices, and consumption amounts.

The relationship between pharmaceutical expenditures and economic growth has been examined considering these existing studies. In addition, this relationship examined is also related to the formation of pharmaceutical prices. This relationship comes from the fact that pharmaceutical prices are the main element of pharmaceutical expenditures. In many studies mentioned earlier, a positive relationship between health expenditures and economic growth was demonstrated. Accordingly, pharmaceutical expenditures would be positively related to economic growth.

The relationship between pharmaceutical expenditure and economic growth was also investigated empirically in the study. The result of the empirical study is providing guidance on determine whether the formation of pharmaceutical prices has an effect on economic growth. There is no positive relationship between pharmaceutical expenditure and economic growth due to the empirical study. This relationship was revealed with empirical findings. The result shows that the effect of pharmaceutical expenditure has not been achieved. The results also show that as the proportion of pharmaceutical expenditure in health expenditures increases, economic growth is not positively affected. Two different reasons emerge for the reason of this situation. Firstly, as previously mentioned, it can be understood that the efficiency condition is not satisfied in the formation of pharmaceutical prices or pharmaceutical expenditure. This is

exactly in line with the issues described throughout the study. Problems in complex legislative structures, pharmaceutical licensing and reimbursement systems have an important role in inefficient pricing and expenditure. The other reason may be directing pharmaceutical expenditure to inefficient pharmaceuticals. What is meant by inefficient pharmaceuticals is that they are not qualitatively or quantitatively effective. These two reasons reduce the effectiveness of health component in human capital.

In short, problems in the structure of pharmaceutical prices or decisions related to pharmaceutical expenditures form inefficient pharmaceutical expenditures. In other words, inefficient pharmaceutical expenditure is caused by ineffective pharmaceutical and inefficiencies in pharmaceutical prices.

All of these issues examined in this thesis are fully compatible with the literature. In addition, the items examined in the study are consistent with the empirical results of the study. In this context, the thesis is consistent in itself.

Solutions and suggestions for the disruptions mentioned in the structure of pharmaceutical prices and pharmaceutical expenditures are presented as follows.

Within Turkey specific conditions, the structure of the legislation, that is the most important factor in determining pharmaceutical prices, can be revised. To enhance transparency of relevant legislation, simpler and more acceptable solutions can be devised based scientific.

In order to determine pharmaceutical prices effectively, the exchange rate used in the reference pricing system can be determined effectively and scientifically. The frequency exchange rate determination can be increased. Control over the expulsion of medicines that are effectively priced, especially by pharmacy stores and other units, can be improved.

A new policy can be devised in order to create competitive and innovative market conditions. Production of pharmaceuticals with problems in procurement or pricing can be encouraged by government at national level. In this context, it is important to focus on state financed R & D expenditures.

In the reference price system, controlling the price of the country of reference and providing price controls by local agents contribute to the effective determination of pharmaceutical prices. Market concentration index studies should be done periodically on and policy should be revised according to findings.

In pharmaceutical pricing, the profits of actors such as pharmacists and warehouses should not be kept constant for all medicines and should vary according to pharmaceuticals. This flexibility provides support to the public sector for pharmaceuticals that are difficult to procure. Similarly, the flexibility of pharmaceutical-share participation rates can also be reviewed.

There are some limitations in this and similar studies. In this study, countries could not be subject to regional segregation as economic growth. The reason for this is the lack of access to data on pharmaceutical expenditures. Moreover, data on pharmaceutical expenditures and the pharmaceutical sector can be obtained from private sources by paying a fee. In scientific studies, free provision of these services can be requested from service providers. It is thought that the amount of accessible data will increase in the following years and it will be beneficial to use the regional data in future studies. Again, it will be useful to carry out the survey studies on the basis of selected companies as a different method in future studies.

Scientific subjects are discussed related to pharmaceutical expenditure within this study. Informing actors about this issue and similar studies will increase the effectiveness in the pharmaceutical expenditure. The effectiveness in the formation of pharmaceutical prices will significantly contribute to both the

availability of pharmaceuticals and the effectiveness of pharmaceutical expenditures. The result of an unavailable or inaccessible pharmaceutical problem can cost human lives. This result indicates the importance of the issue. The main purpose of the study is to contribute positively to human life. Therefore, the problematic aspects of pharmaceutical prices are examined in detail and they are presented with solution suggestions.

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APPENDIX1. PVAR ANALYSIS TEST RESULTS

Table 10. Panel VAR Lag Order Selection on Estimation Sample

Selection order criteria — No. of obs = 374
Sample: 1994 - 2015 — No. of panels = 17
Ave. no. of T = 22.000

lag	CD	J	pvalue	MBIC	MAIC	MQIC
1	.9996959	14.45306	.2727169	-56.63801	-9.546943	-28.24427
2	.9997147	7.719507	.4613381	-39.67454	-8.280493	-20.74537
3	.9996434	5.084521	.2787345	-18.6125	-2.915479	-9.147919

Table 11. Panel Vector Autoregresssion

GMM Estimation
Final GMM Criterion Q(b) = .0386
Initial weight matrix: Identity
GMM weight matrix: Robust

No. of obs = 374
No. of panels = 17
Ave. no. of T = 22.000

	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
hdi						
hdi L1.	.9348296	.010879	85.93	0.000	.9135071	.9561521
phaspe L1.	-.7223031	.292812	-2.47	0.014	-1.296204	-.1484021
phaspe						
hdi L1.	-.0051516	.0020662	-2.49	0.013	-.0092012	-.001102
phaspe L1.	.9102421	.0872643	10.43	0.000	.7392072	1.081277

Table 12. Panel VAR-Granger Causality Wald Test

Equation \ Excluded		chi2	df	Prob > chi2
hdi				
	phaspe	6.085	1	0.014
	ALL	6.085	1	0.014
phaspe				
	hdi	6.217	1	0.013
	ALL	6.217	1	0.013

Table 13. Stability Condition

Eigenvalue		
Real	Imaginary	Modulus
.9847626	0	.9847626
.8603091	0	.8603091

Figure 6. Stability Condition

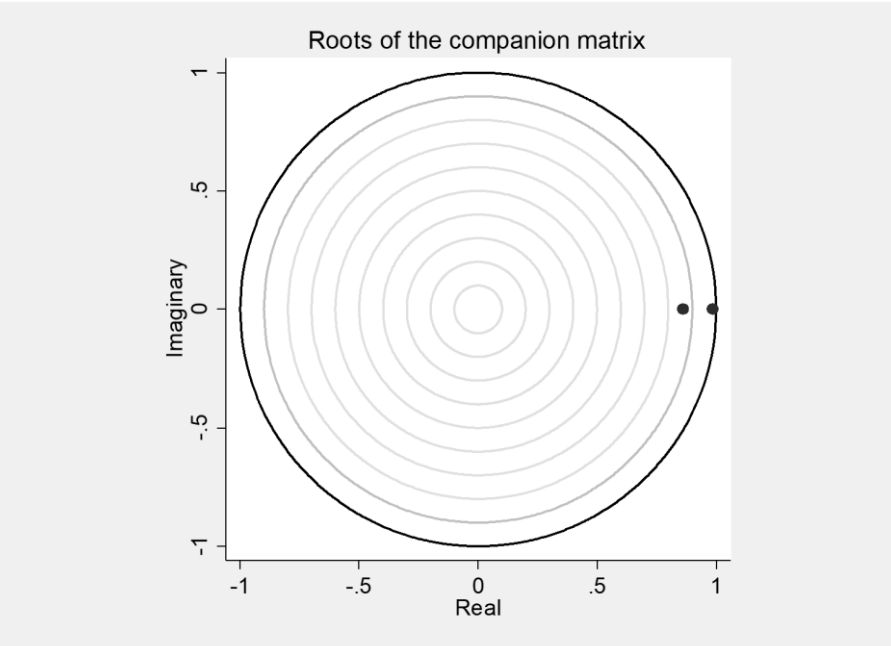
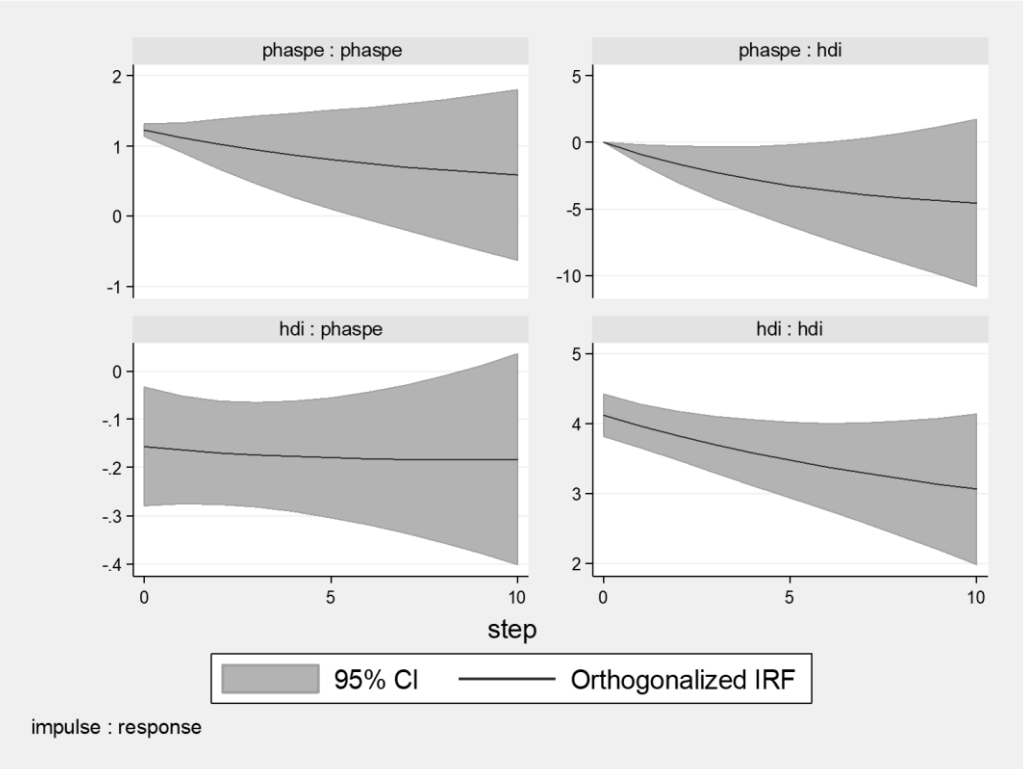


Table 14. Variance Decomposition

Response variable and Forecast horizon	Impulse variable	
	hdi	phaspe
hdi		
0	0	0
1	1	0
2	.9764989	.0235011
3	.931766	.0682339
4	.8763016	.1236984
5	.8178684	.1821316
6	.7612346	.2387654
7	.7088565	.2911434
8	.6617005	.3382995
9	.619885	.380115
10	.5831003	.4168997
phaspe		
0	0	0
1	.0160225	.9839776
2	.0183013	.9816987
3	.0206488	.9793512
4	.0230426	.9769574
5	.0254618	.9745381
6	.0278878	.9721122
7	.030304	.969696
8	.0326963	.9673037
9	.0350527	.9649473
10	.0373634	.9626366

Figure 7. Variance Decomposition



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APPENDIX3. ORIGINALITY REPORT

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