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THE RELATIONSHIP BETWEEN ECONOMIC GROWTH AND EDUCATION IN TURKEY, FINLAND AND SOUTH KOREA

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The Relationship between Economic Growth and Education in Turkey, Finland and South Korea

Türkiye, Finlandiya ve Güney Kore'de Eğitim ve Ekonomik Büyüme Arasındaki İlişki

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LIST OF ABBREVIATIONS

ADF: Augmented Dickey Fuller

ARDL: Autoregressive Distributed Lag

EU: European Union

GDP: Gross Domestic Product

GNP: Gross National Product

ISCED: The International Standard Classification of Education

OECD: Organization for Economic Co-operation and Development

R&D: Research and Development

SAARC: South Asian Association for Regional Cooperation

TURKSTAT: Turkish Statistical Institute

UNESCO: United Nations Educational, Scientific and Cultural Organization

VAR: Vector Auto Regressive

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$: United States Dollar

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ABSTRACT

Education is the main source of human capital accumulation. Human capital has become one of the important issues in explaining economic development. Especially endogenous growth models included human capital to explain economic growth. In this study, the importance of education and human capital in economics has been examined in the light of studies in literature and an empirical analysis is made for Turkey, Finland and South Korea. Comparison of Turkey with the two countries, one from EU and the other from East Asia, was deemed plausible. Finland is considered to have the best education system and most successful schools and South Korea, another successful country in education, had similar GDP per capita levels in 1980s whereas now it has much higher levels than Turkey. By using secondary and tertiary education enrollment rate and GDP per capita variables, the relationship between education and economic growth is tested. The data set includes the period between 1971 and 2013 obtained from World Bank database. According to the cointegration method results, there is a long run relationship between education and economic growth for Turkey and Finland. For South Korea, only the relationship between tertiary education and economic growth is significant. The effect of education on economic growth is higher in South Korea and Finland compared to Turkey. We argue that the different findings regarding effect of education on the economy are due to institutional factors and cultural differences across countries as well as other characteristics.

ÖZET

Eğitim, beşeri sermaye birikiminin ana kaynağıdır. İnsan sermayesi, ekonomik kalkınmanın açıklanmasında önemli konulardan biri haline gelmiştir. Özellikle endojen büyüme modelleri, ekonomik büyümeyi açıklamak için beşeri sermayeyi içermektedir. Bu çalışmada, ekonomide eğitim ve beşeri sermayenin önemi literatürdeki çalışmalar ışığında incelenmiş ve Türkiye, Finlandiya ve Güney Kore için ampirik analizler yapılmıştır. Türkiye'yi biri AB diğeri Uzak Doğu'dan iki ülke ile karşılaştırmak uygun görülmüştür. Finlandiya, en iyi eğitim sistemi ve en başarılı okullara sahip ülkelerden biri olarak değerlendirilirken eğitimde diğer bir başarılı ülke olarak Güney Kore, 1980'li yıllarda Türkiye'yle benzer kişi başına düşen GSYH'ye sahip olmasına rağmen bugün Türkiye'den daha ileride bulunmaktadır. Ortaöğretim ve yükseköğretim düzeyinde kayıt oranı ve kişi başına düşen GSYH değişkenleri kullanılarak eğitim ile ekonomik büyüme arasındaki ilişki test edilmiştir. Veri setinde, Dünya Bankası veri tabanından alınan 1971-2013 arası dönem yer almaktadır. Eş bütünleşme yönteminin sonuçlarına göre, Türkiye ve Finlandiya için eğitim ve ekonomik büyüme arasında uzun vadeli bir ilişki mevcuttur. Güney Kore için sadece yükseköğretim ile ekonomik büyüme arasındaki ilişki anlamlı görünmektedir. Eğitimin ekonomik büyüme üzerindeki etkisi Güney Kore ve Finlandiya'da Türkiye'ye kıyasla daha yüksektir. Diğer faktörlerin yanı sıra, bulguların farklılaşmasında ülkeler arasındaki kültürel ve kurumsal faktörlerin etkili olduğu düşünülmektedir.

INTRODUCTION

Education has become one of the main issues in explaining economic growth in both developing and developed countries. Education is an important factor for measuring human capital in the population. Especially with the change of production methods after the Industrial Revolution, development in human capital has become more important in economic activities. Progress in science and technology also has had positive effects on production facilities in the late of 20th century and in the beginning of 21th century.

As it is well known, population is a production factor as the source of labor. High growth in population would have been sufficient to trigger growth in labor-intensive basic production fields such as agriculture in the past. However, even in agriculture, population growth alone is not enough to explain production increase. High population and labor capacity are unable to explain the economic gap between developed and developing countries since productivity has became more important than the quantity of labor as a production factor. In modern economic growth theories, technology and human capital are taken into consideration in explaining economic growth. Barro (1999) analyzed the positive relationship between schooling and economic growth. Also Lucas (1988) states that economic growth is a consequence of accumulation of human capital. Several empirical studies focus on the relationship between education and economic growth. These academic studies and papers guide policy makers to support and change the education system that stimulate economic growth.

Before understanding the linkage between human capital and economic development, it is important to take into account how the human capital level is measured. To determine the educational level of the population, mainly the literacy rate is used. However, it is not enough to state the differences in the level of education between the countries or regions. Another measure for educational level is the number of graduates in primary, secondary and tertiary schooling.

There are also financial indicators that show the importance of education in a society. Especially expenditure on education is the most common variable in determining the impact of education on economic growth. Mainly public spending as a percentage of total government spending or total GDP are used to define the significance of expenditure on education.

In this study enrollment in secondary and tertiary education for the years between 1971 and 2013 is used for Turkey. To understand the relationship between educational level and economic growth, the Engle Granger cointegration method is applied. The same method is used in analyzing the same relationship for South Korea and Finland to compare the results with Turkey.

CHAPTER 1

EDUCATION AND ECONOMIC GROWTH IN TURKEY

1.1. EDUCATIONAL SYSTEM IN TURKEY

In Turkey, the educational system is under control and supervision of the state, namely the Ministry of National Education. According to the constitution everyone has the right to education. Education is free in public schools, but there are also private schools available. The academic year begins in mid-September and continues to mid-June.

Pre-school education is optional and is up to 6 years of age. Primary education is compulsory and the duration is 8 years. After the 2012-13 education year, primary education is divided into two stages as primary school (4 years) and lower secondary school (4 years middle school).

Secondary education, which is compulsory as well, consists of 4 years of high school or vocational high school. Tertiary education could be 4 years of university or 2 years of vocational college. Some programs may have 1-year language study. There are also graduate studies such as 2-year master's study or 4-year PhD. Higher education institutions could be either public or owned by foundations.

1.1.1. Primary Education

Turkish education system, especially primary education, has changed several times in the last 20 years. Before 1997, only 5-year elementary school was compulsory. Middle school was 3 years. After 1997, these two become compulsory and primary education became uninterrupted with 8 years compulsory schooling. The system has changed after 2012, in which primary education is divided into two parts, 4 years primary school and 4 years lower secondary school.

Table 1. 1: Net Schooling Ratio in Primary Education (Turkey)

Educational year	Net schooling ratio (%)	Number of students
1997-1998	84.74	9,084,635
1998-1999	89.26	9,609,050
1999-2000	93.54	10,028,979
2000-2001	95.28	10,480,721
2001-2002	92.40	10,477,616
2002-2003	90.98	10,331,645
2003-2004	90.21	10,479,538
2004-2005	89.66	10,565,389
2005-2006	89.77	10,673,935
2006-2007	90.13	10,846,930
2007-2008	97.37	10,870,570
2008-2009	96.49	10,709,920
2009-2010	98.17	10,916,643
2010-2011	98.41	10,981,100
2011-2012	98.67	10,979,301

Source: Turkish Statistical Institute (TURKSTAT), Education Statistics, 2017

As shown in the table, schooling ratio increased in the beginnig of the 2000s; however, it decreased during 2003-2006. After the year 2006, the schooling ratio in primary education started to increase and reached 98 % in 2012.

The number of students in primary education is relatively high in Turkey due to its younger population and education becomes more important for Turkey as a developing country.

As mentioned above, with the 2012-13 education year the primary education has been divided into two parts.

Table 1. 2: Net Schooling Ratio in Primary and Junior High School

	Primary school		Lower secondary school	
	Net schooling ratio (%)	Number of students	Net schooling ratio (%)	Number of students
2012-2013	98.86	5,593,910	93.09	5,566,986
2013-2014	99.57	5,574,916	94.52	5,478,399
2014-2015	96.30	5,434,150	94.35	5,278,107
2015-2016	94.87	5,360,703	94.39	5,211,506

Source: TURKSTAT Education Statistics, 2017

The table 1.2 shows the statistics for primary school and lower secondary school seperately. The table shows that net schooling ratio in primary school is higher than in lower secondary level. It implies that although it is compulsory, some of the children do not continue schooling after primary school. Even so, number of students in primary education is very high in Turkey being one of the highest numbers in European countries. For instance Germany, which has a similar population level, has only 2.9 millon students in primary education that is almost half of Turkey. Turkey's relatively young population could be an advantage for the labor force. Therefore, education becomes more important to prepare this population for the future in the development process.

Although Turkey has a higher number of children in primary school, the number of teachers is not as high as the EU countries. For instance in Germany there are 2.9 million students and 233 thousands teachers in 2013. In Turkey, there are more than 5 million students but only 282 thousands teachers in 2013 indicating that the number of students per teacher is quite high as compared to EU countries. This implies that besides quality issues, Turkey has to increase investments and the number of teachers for better education.

1.1.2. Secondary Education

Secondary education includes high schools and vocational high schools and it lasts 4 years. After 2012, secondary education has become compulsory together with primary education.

Table 1. 3: Net Schooling in Secondary Education (Turkey)

	Net schooling ratio (%)	Number of schools	Number of Teachers	Number of students
1997-1998	37.87	5,624	140,619	2,129,969
1998-1999	38.87	5,963	145,903	2,280,676
1999-2000	40.38	6,000	143,379	2,316,350
2000-2001	43.95	6,291	140,969	2,362,653
2001-2002	48.11	6,367	144,884	2,579,747
2002-2003	50.57	6,210	137,956	3,023,602
2003-2004	53.37	6,941	147,776	3,014,392
2004-2005	54.87	6,816	167,614	3,039,449
2005-2006	56.63	7,435	185,317	3,258,254
2006-2007	56.51	7,934	187,665	3,386,717
2007-2008	58.56	8,280	191,041	3,245,322
2008-2009	58.52	8,675	196,713	3,837,164
2009-2010	64.95	8,913	206,862	4,240,139
2010-2011	66.07	9,281	222,705	4,748,610
2011-2012	67.37	9,672	235,814	4,756,286
2012-2013	70.06	10,418	254,895	4,995,623
2013-2014	76.65	10,955	278,641	5,420,178
2014-2015	79.37	9,061	298,378	5,691,071
2015-2016	79,79	10,550	335,690	5,807,643

Source: TURKSTAT Education Statistics, 2017

The table 1.3 shows the statistics for secondary education in Turkey. The net schooling ratio doubled in the last 20 years. In 1990s it was under 40% whereas in 2016 it reached almost 80% in parallel with number of students. As the education investments increase and secondary education becomes compulsory, the ratio of schooling improved.

1.1.3. Tertiary Education

All the educational institutions after secondary education constitute higher education. Higher education institutions are universities, faculties, institutes, colleges, conservatories, vocational colleges and centers for practice and research. Undergraduate programmes last 4 years in general. However, there may be prep classes in some programmes. Vocational colleges provide 2 years of education. There are also graduate programs such as masters' and doctorate degree programs. Duration of education is 2 or 4 years depending on the program.

In the last decade, the number of universities has increased dramatically in Turkey, The latest statistics for 2017 shows that there are currently 112 state universities, 65 foundation universities and 6 foundation vocational training schools in Turkey[1].

Table 1.4 shows the number of students in the higher education system. There are nearly 7.2 million students in the higher education system. 2.5 million students are in vocational training schools. The number of undergraduate students exceeds 4 million. However, less than a half of the students are studying in formal education. In Turkish education system, formal education mainly refers to daytime programs at universities while secondary education in the table reflects the evening programs. The number of students in the open education system is higher than the number of students in the daytime and evening programs.

Graduate education has also become popular in the last decade. There are 480 thousand students studying in master's programs. However, students who choose to continue to doctorate programs is relatively low.

[1] According to the Higher Education Information Management System in website of Council of Higher Education

Table 1. 4: The Number of Students in Higher Education in Turkey

	Total	State Universities	Foundation Universities	Foundation Vocational Training School
Total	**7,198,987**	**6,629,961**	**554,218**	**14,808**
Vocational Training Sch	**2,555,926**	**2,408,285**	**132,833**	**14,808**
Formal Education	767,185	662,825	933,73	10,987
Secondary Education	342,441	301,778	37,351	3,312
Distance Education	33,909	31,291	2,109	509
Open Education	1,412,391	1,412,391		
Undergraduate	**4,071,579**	**3,745,367**	**326,212**	
Formal Education	1,721,287	1,395,375	325,912	
Secondary Education	427,879	427,879		
Distance Education	28,007	27,707	300	
Open Education	1,894,406	1,894,406		
Master's	**480,215**	**393,552**	**86,663**	
Formal Education	400,768	325,338	75,430	
Secondary Education	49,483	49,421	62	
Distance Education	29,964	18,793	11,171	
Doctorate	**91,267**	**82,757**	**8,510**	
Formal Education	91,267	827,57	8,510	

Source: Council of Higher Education (2017), Higher Education Information Management System, Student Figures Summary Table

1.2. ECONOMIC GROWTH IN TURKEY

Turkey as a developing country has an irregular growth process. Since the foundation of the Republic, diverse economic policies have been implemented. In the first years of the Republic in the 1920's, Turkey economy had an open economy and there was shortage of domestic savings for investment. The Great Depression of 1929 had an impact on the Turkish economy as it did in the rest of the world. In this period, policies favoring a closed economy and nationalization were adopted. The state made large investments for economic revival and growth. The period is marked by a process of growth based on state industrialization. During 1930-39, the Turkish economy grew an average of about 5.8% per year (Boratav (2013:72).

The period of 1940-45 is maked by World War II, which effected the economy negatively. After the war from 1946, the policies changed and Turkey transformed from a closed economy to an open economy and liberal policies were implemented. Between 1946 and 1953, the economy experienced about 10% averge growth per year, marking a recovery from the effects of the war (Boratav, 2013:101).

In the period 1954-1961, government investments played a significant role in the economy; liberal economic policies were abandoned and the average growth rate declined to 4.4% (Boratav, 2013:111).

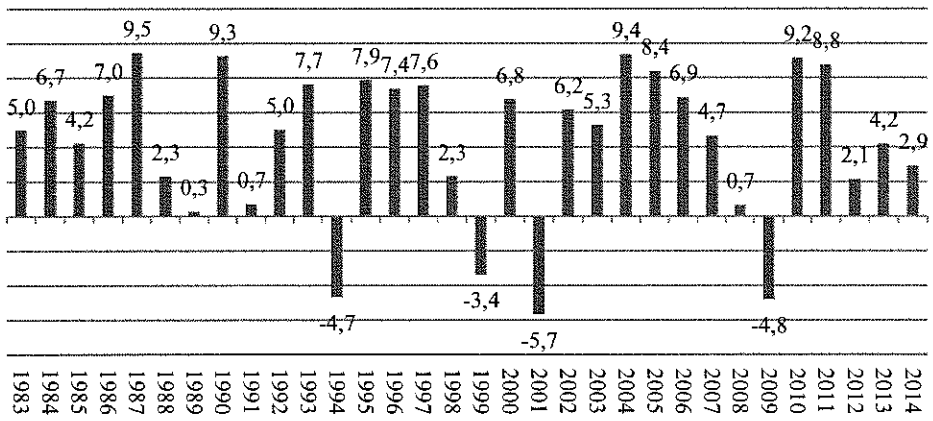
In the 1960s, the Turkish economy planned economic policies were adopted. In addition, import substitution was an important economic policy in this period. However, this policy could not stop the increase in imports and could not stimulate exports; therefore, the trade deficit expanded. In the period of 1962-1976 Turkish economy had an average of 6.8% per year.

At the end of the 1970s, Turkey faced with not only economic but also political crisis. In 1980, new economic measures, named decisions of January 24, were adopted. Furthermore, a military coup interrupted the democratic regime.

After 1980, the Turkish economy entered a different path as liberalized economic policies and integration into the world economy came to the forefront. Restrictions on foreign exchange, trade and investments were removed and an export-led growth policy was adopted.

Although Turkey had experienced several economic crises after the 1980s, the liberal and open economic policies continued to be the main pillars of economic thinking. Economic crises stemming from domestic or foreign factors emerged; for instance in 1994 and 1999 the economy shrank and faced with a negative growth rate. The figure below shows economic growth rates between 1983 and 2014.

Figure 1.1: Economic Growth in Turkey



Source: TURKSTAT, 2014

The figure reveals that Turkey experienced economic crises in 1994, 1999, 2001 and 2009, exhibiting an irregular and unstable growth path. After the 2001 financial crisis, with the help of political stability, the economy grew rapidly until 2008. However, because of the the global financial crisis of 2008-2009 which started in the USA, the Turkish economy was effected and a decline in the growth was observed. The average economic growth in 2002-2014 is 4.7% in Turkey. The whole years' average growth rate from the beginning of the Republic is 4.8%. It is clear that to converge to the developed countries; Turkey has to have higher growth rates.

CHAPTER 2

THE ROLE OF EDUCATION IN ECONOMIC GROWTH

2.1. EDUCATION AND HUMAN CAPITAL

Education is a social process that strengthens the development and welfare of individual, society and the future humanity (Pamuk and Bektaş, 2014:78).

The Oxford Dictionaries define education as a process of giving or receiving a systematic instruction, especially at school or university. Another definition is that education is an act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgments, and generally of preparing oneself or others intellectually for mature life (www.dictionary.com)

Akyüz (2001) defines the concept of education as the process of change in the knowledge, thought and behavioral structure.

Another definition of education is the sum of the processes in which the individual acquires the ability, orientation, attitude and other forms of behavior that are practical values in the society in which the individual lives (Tezcan, 1992:142).

Thus, education may be defined as a process of acquiring knowledge, skills, beliefs and habits in order to prepare one for life.

Generally, formal education is divided into several stages such as preschool, primary school, secondary school and tertiary school. Preschool provides education starting from age of 3 to 6 or 7 depending on legislation in the country. Currently, in Turkey, preschool covers children up to six years of age. In some societies, preschool is accepted as part of compulsory education. According to ISCED, preschool is defined as early childhood education and as a program at ISCED level 0[2]. Moreover, this level of education is designed to support children's early

[2]International Standard Classification of Education (ISCED) belongs to the United Nations International Family of Economic and Social Classifications, which are applied in statistics

cognitive, physical, social and emotional development and introduce young children to organized instruction outside of the family context. Early childhood programs aim to develop socio-emotional skills necessary for participation in school and society (UNESCO, 2012).

Primary education is mostly compulsory and most of the countries have committed to achieve universal enrollment in primary education. In Turkey, primary education includes 4-year compulsory primary school and 4-year compulsory lower secondary school.

Secondary school, also named as upper secondary education in the case of Turkey, gives common knowledge to prepare for higher education or for various occupational fields. It is compulsory and lasts at least 4 years. There are different types of secondary schools, such as general high school, vocational and technical high school, Anatolian high school and science high school, which are are examples of secondary educational institutions in the Turkish education system.

Tertiary education is higher education provided by colleges or universities. It is not compulsory and it generally refers to all post-secondary education. According to the World Bank, a diverse and growing set of public and private tertiary institutions in every country- colleges, technical training institutes, community colleges, nursing schools, research laboratories, centers of excellence, distance learning centers, and many more- form a network of institutions that prepare students for application of knowledge at advanced level. In tertiary education, there are undergraduate and graduate programs. Undergraduate programs include post secondary education and in most cases, the duration of education is 4 years. In some countries, there may be prep classes for studying a foreign language. When a student completes the undergraduate degree, he/she gets

worldwide with the purpose of assembling, compiling, and analyzing cross-nationally comparable data. It is designed to serve as a framework to classify educational activities as defined in programs and the resulting qualifications into internationally agreed categories.

a bachelor's degree. Graduate programs include master's and doctorate programs and require an undergraduate degree.

The change in living conditions together with increasing need for information in the production process, as well as the change, increase and diversification in the qualifications required in the working life makes education a long lasting process throughout life (Çalışkan, Karabacak and Meçik, 2013:31).

When education is considered in relation to the economy, it increases the social creativity and productivity of the society, raises the quality and quantity of the workforce required for development and allows individuals for the ability to grow and get a job based on their abilities (Kaynak et al., 2000:124). Education increases productivity by increasing the ability to access knowledge and new information on specific topics (Rosenzweig, 2010:8).

The relationship between education and the economy can be built through human capital. Education can be considered as the main source of human capital accumulation. Human capital is defined as skills and knowledge that an individual uses to increase the value of the labor market (Saxton, 2000:1). According to Bartolo, human capital is an assessment of the individual's ability to generate income (Bartolo, 1999:56). As it is seen, there is not only one kind of capital, e.g. physical capital, in economic literature that affects the production. Human capital is important to increase coordination between production factors. As a consequence of technological improvement in production, the need for more educated people increases. According to the human capital theory, education is considered to be the most effective factor that reduces the risk of unemployment and the main source of human capital that affects the individual's lifetime income positively and directly (Nasir and Nazli, 2000:1). Therefore, human capital increases the productivity of labor and capacity of labor to learn new abilities.

As the level of education increases, the reduction in the risk of unemployment is regarded as an important return of education (Mincer, 1991:22). Especially, tertiary schools are important to educate human for industrial and

knowledge economy. Increase in education level is generally linked to the source of increase in human capital accumulation. However, education is not restricted by tertiary school. Even at work, labor need training processes to adapt new improvements in production technologies. The concept for not limiting learning to schools or formal education is called lifelong learning and is becoming a pervasive trend in many countries. According to this concept, every member of society should have opportunities for learning at every stage of their life.

2.2. THE ROLE OF EDUCATION IN THE HISTORY OF ECONOMIC THOUGHT

The role of education in the economy is important in terms of how educational qualities are used in the production process and what it does (Ünal, 1993:225). Although the importance and effect of education on the economy cannot be proved directly, its contribution to society and production processes has been subject to extensive discussion historically and indirect links have been demonstrated.

From Mercantilists to Neoclassical Economists, each school of economic thought searched for the sources of economic development and sought to identify the factors with the highest contribution. Mercantilists were the first to acknowledge the importance of education and recognize human capital as a factor of economic development (Deyon, 1969:1-20; Brasseul, 1997:150). In Mercantilist thought, an educated merchant is considered as vital for a country as a blood for the body (Serin, 1972:4-5).

Classical economists consider education in terms of population growth. According to Malthus (1836) education helps to control population growth and increase the national income. If people are less educated, the pressure of increasing population will increase discomfort of society and prevent economic development (Öztürk, 2005:29). David Ricardo, another classical economist, also considers

education as a control mechanism for population growth. According to him, population planning can be achieved by education (Serin, 1972:10).

A classical economist who paid attention to the contribution of education to the economy was Senior. Senior suggests that population growth decreases while the number of educated people increases. He proposes that uneducated people cannot evaluate children's needs; therefore, the government has to intervene effectively in the educational system.Senior argues that education can control population growth by breaking the circle of poverty and ignorance (Serin, 1972:10-11).

Another classical economist J. S. Mill proposed, as Malthus did, that education would slow down the growth rate of population and further asserted that universal education is in the public interest (Öztürk, 2005:29). Marshall (1890), another classical economist, also addressed the importance of education and defined the effort on education as a national investment. Classical economists focused on the impact of education on population growth. According to Marshall, some families do not see the future and therefore direct their children to their profession. The result is that the labor force has lost its fluidity (Öztürk, 2005:29).

Keynesian thought characterizes education as a semi-public good, and as a service to be provided by a social welfare state. How to provide and use educational resources, how to organize educational services, what role the government will play in education have been discussed among Keynesian economists (Öztürk, 2005:30).

After the World War II, great economic changes in especially Western Europe and Japan showed the importance of an educated workforce and human capital in using physical capital investment.

2.3. HUMAN CAPITAL AND ENDOGENOUS GROWTH MODELS

Human capital theory, which explains the role of education in the development process, asserts that by investing in people, the development process can be accomplished in a shorter time (Schultz, 1971:24). Kuznets and Friedman were the first to draw attention to the importance of human capital investments in economic development. Schultz (Akalın, 2000:224) accomplished the transformation of this enterprise into a theory.

In time, the importance attributed to human capital in economic development has increased among researchers. Fuente and Ciccione (2003) cited that according to the human capital theory, human capital is at least as important as physical capital in achieving socio-economic development and achieving structural change (Öztürk, 2005:31).

Human capital accumulation has become important for researchers in explaining growth models as well. Especially with the endogenous growth models, human capital has been part of the model to understand the economic growth of countries. Lucas (1988), in his study, explained the relationship between human capital factor and economic growth. In this model, human capital is the driving force of economic growth. According to Lucas (1988), there are two kinds of accumulative capital and they are physical and human capital. This model implies that there is human capital accumulation with education, and increase in human capital will increase the productivity of labor, a process which is called an endogenous effect. In addition, increase in human capital can have positive effects on others' productivity and this is called an exogenous effect. This exogenous effect provides benefits without the need for extra time spent by others for human capital accumulation (Yardımcı, 2006:47).

Lucas (1988) discusses three models based on human capital in his study:

-Physical capital accumulation and technological development model

-Human capital accumulation model through education

-Human capital accumulation model through learning by doing (Lucas, 1988:3).

According to this model, technological development occurs spontaneously with an increase in human capital accumulation. Thus, technological development that stimulates economic growth depends on human capital accumulation.

Mankiw, Romer and Weil (1992) included the human capital factor in the Solow Growth Model. By including human capital, the Solow model can explain the growth differences throughout the world.

Another endogenous growth model is AK model that developed by Rebello. In Rebello's AK type production there is a linear relationship between capital factor and output. Capital includes human capital as well in this model.

Romer's (1990) horizontal product development model focuses on R&D based endogenous technological development. Total human capital is divided into two parts: first is human capital that is used in the final goods sector and the other is that used in the R&D sector. If the total human capital level is too low, there can be stagnation in the economy. The return of investment in human capital in the research sector is a stream of net income that a project will generate in the future. Therefore, the less allocation of human capital to research means less growth rate (Romer, 1990:93).

Generally, in endogenous growth models growth is closely related to technological development. In models that were improved by Lucas, Romer, Rebello and Barro, technological development emerges with physical and human capital accumulation. In other models studied by Romer, Grossman and Helpmann, Aghion and Howitt there is a R&D sector in the economy and increase of human capital in this sector will stimulate technological development (Yardımcı, 2006:75).

To sum up, education and educated labor are important in endogenous growth models. Education increases the human capital accumulation and productivity of labor. Endogenous growth models show that education affects

economic growth in two ways. First, human capital is included in the production function directly unlike the neoclassical model. Second, technological development that stimulates endogenous growth is related to human capital. In addition, human capital does not only stimulate technology in the country, it also helps adaptation and application of technology imported from other countries (Benhabib and Spiegel, 1994:156).

2.4. LITERATURE REVIEW

There are several economic studies to clarify the relationship between education and economic growth. Education is known as the source of human capital accumulation, which is closely related to economic growth. Barro (1991) has pioneer works that explain the relationship between growth and education. In that paper, 98 countries in the period of 1960-1985 are studied. According to the results, the growth rate of real per capita GDP is positively related to initial human capital (school enrollment rates). Another study of Barro (2001) that analyzes the impact of human capital on growth captures 100 countries for the period of 1960-1995. He found that secondary and tertiary schooling rate has a positive effect on economic growth. He also used the success of students on international exams on reading, mathematics and science as the variable to show the quality of education. He found that scores on science exams are closely related to economic growth.

Krueger and Lindhal (1999) also studied the effect of schooling on income and on GDP growth. They found that initial level of education does not appear to have a significant effect on economic growth among OECD countries. Gemmel (1996) used simple school enrollment rates in his study and analyzed the developing and developed countries in the period of 1960-1985. He found a significant positive effect of school enrollment on economic growth. Asteriou ve Agiomirgianakis (2001) studied the relationship of education and growth for Greece. They used school enrollment rate in primary, secondary and tertiary levels

for the period of 1960-1994 and found that school enrollment rate has a positive relationship with per capita GDP.

One of the most recent studies of Hanif and Arshed (2016) tested the relationship between school education and economic growth for SAARC[3] countries by using a panel data set. By comparing education levels, they found that tertiary education enrollment has higher impact on growth than primary and secondary enrollment.

Öztunç et al. (2015) examined the effects of female education on economic growth for the Asia Pacific region. The study focused on the period between 1990 and 2010 using data for randomly selected countries in that region. They found that female primary school enrollment is a significant factor for annual per capita income growth.

Çoban (2004) tested the relationship between school enrollment rate in different levels and GNP for Turkey including the period of 1980-1997. According to the results, the increase in enrollment rate in the primary education causes an increase in economic growth and, in turn, the increase in economic growth causes an increase in enrollment rate of high school education. In addition, the increase in the enrollment rate in the higher education is a result of the increase in the enrollment rate of the high school education. In addition, an increase in the expenditure on education causes an increase in the enrollment rate of high school education (Çoban, 2004:131). As a result, there is a long run relationship between education variables and GNP.

Serel and Masatçı (2005) analyzed the relationship of human capital and economic growth for Turkey. They used variables of GNP, secondary schooling, fixed capital investments and total employment for the period of 1950-2000. They found that there is a positive relationship between human capital and economic growth. On the other hand, Şimşek and Kadılar (2010) analyzed the relationship

[3] South Asian Association for Regional Cooperation, established with the idea of developing regional co-operation among South Asian countries.

between trade, human capital and economic growth for Turkey including the period of 1960-2004. The results show that human capital accumulation supports economic growth. They used higher education registration series as the human capital variable. Ergen (1999) by using data of 67 provinces in Turkey analyzed the effect of human capital on growth. The results suggest that average schooling increases the GDP.

Çakmak and Gümüş (2005) discussed the long run relationship of human capital with economic growth. By using cointegration analysis for the years between 1960 and 2002, the results indicate that there is positive relationship between human capital and economic growth. They formed a human capital index including primary, secondary and higher education graduates.

Akgül and Koç (2011) studied the relationship between GNP and number of higher education graduates using time series of Turkey and including the period of 1914-2009. The results show that education is a significant part of economic growth. Özsoy (2009) analyzed the relationship between the number of students and real GDP by using VAR model including the period of 1923-2005 for Turkey. According to results, there is a positive relationship between education and economic growth.

As it is seen, some of the studies use school enrollment, schooling rates and number of graduates or students for measuring human capital. However, there are also some studies that use education expenditures to analyze the effect of human capital on economic growth.

Blankenau et al. (2007) studied the effect of government education expenditure on economic growth by using 23 countries' panel data. They found that there is a positive long run relationship between education expenditures and economic growth. Nevertheless, there is no relationship for poor countries. Riasat et al (2011) used ARDL test to analyze the effect of education expenditures on economic growth for Pakistan. The results show that increase in education expenditure has positive effect on economic growth. Li and Kong (2012) studied

for China to find the relationship of education expenditures with economic growth. Research findings show that there is a long- run relationship between expenditures on education and economic growth. According to causality analysis, there is causality from economic growth to education expenditures. Kıran (2013), in his paper, analyzed the effect of education on economic growth for 18 Latin countries by using a cointegration method. In these countries, except seven of them, there is a cointegration relationship between education and economic growth.

There are also studies examining the relationship between education and economic growth for Turkey. For instance, Kar and Ağır (2006) tested causality relationship between economic growth and education. Health and education expenditures used for measuring human capital and per capita GNP used for economic growth. The results indicate that human capital and economic growth affect each other in the long run. Karataş and Çankaya (2011) used annual variables for 1981-2006 to analyze the effect of human capital investment on economic growth for Turkey. They used education expenditure ratio, health expenditure ratio, higher education schooling and physical capital ratio as independent variables. The results show that physical capital investments are more effective on economic growth in Turkey. Akçacı (2013) in his study tested the relationship between education and economic growth by using Toda-Yamamoto causality test. The study covers the period between 1998 and 2012. The results show that there is causality from education expenditures to economic growth.

CHAPTER 3

ECONOMETRIC ANALYSIS FOR TURKEY AND A COMPARISON WITH FINLAND AND SOUTH KOREA

3.1. METHODOLOGY

In this study, there will be an econometric analysis for Turkey to understand the relationship between education and economic growth. After that, the same econometric analysis will be made for Finland and South Korea. Comparison of Turkey with the two countries, one from EU and the other from East Asia, was deemed plausible. Nordic countries, especially Finland, are considered to have the best education system and most successful schools. South Korea, on the other hand, had similar GDP per capita level with Turkey in the 1980s, whereas as of 2015, South Korea's GDP per capita is 188% higher than Turkey[4]. In addition, as shown below, South Korea and Finland are among the most successful countries in PISA (The Programme for International Student Assessment) which is organized by OECD with the aim of testing the skills and knowledge of 15 year old students worldwide. Econometric results will show us the different effects of education on economic growth in these countries.

[4] Calculated from the data in World Economic Forum's The Global Competitiveness Report 2016-17

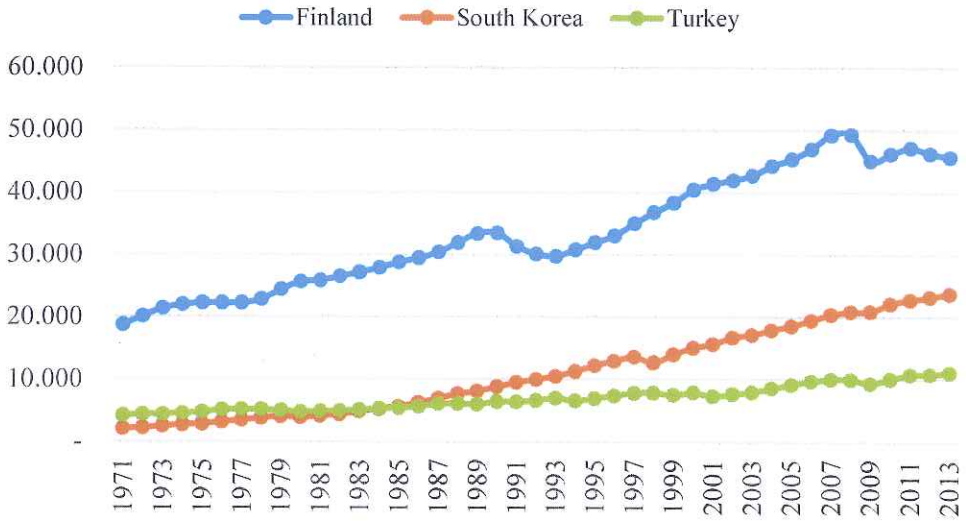
Table 3. 1: Comparison of Countries - PISA 2003-2015 Rankings

Ranking in Mathematics	**2003**	**2006**	**2009**	**2012**	**2015**
Finland	1	2	6	12	13
South Korea	2	4	4	5	7
Turkey	35	43	43	44	49
Ranking in Science	**2003**	**2006**	**2009**	**2012**	**2015**
Finland	1	1	2	5	5
South Korea	2	11	6	7	11
Turkey	33	44	43	43	52
Ranking in Reading	**2003**	**2006**	**2009**	**2012**	**2015**
Finland	1	2	3	6	4
South Korea	2	1	2	5	7
Turkey	35	37	41	41	50
Number of Participating Countries/Economies	41	57	65	65	70

Source: OECD

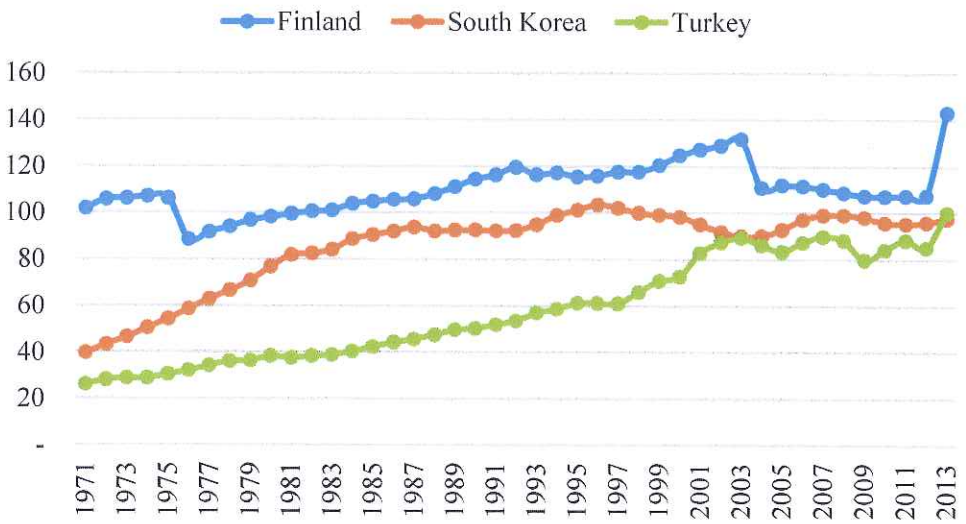
The development of three indicators used in the analysis are shown below. Finland is considerably more developed in terms of GDP per capita and enrollment rates than the other two countries. However, for tertiary enrollment rates, it seems that South Korea caught up and left Finland behind in recent years. On the other hand, although Turkey shows a relatively increasing trend for all of indicators, it remained below the other two countries. Nevertheless, enrollment rates of Turkey has converged to South Korea and Finland which implies that it is possible for Turkey to see the benefits of improvements in enrollment rates in the next few decades.

Figure 3.1: GDP per Capita Levels in Finland, South Korea and Turkey (Constant 2010 US$)



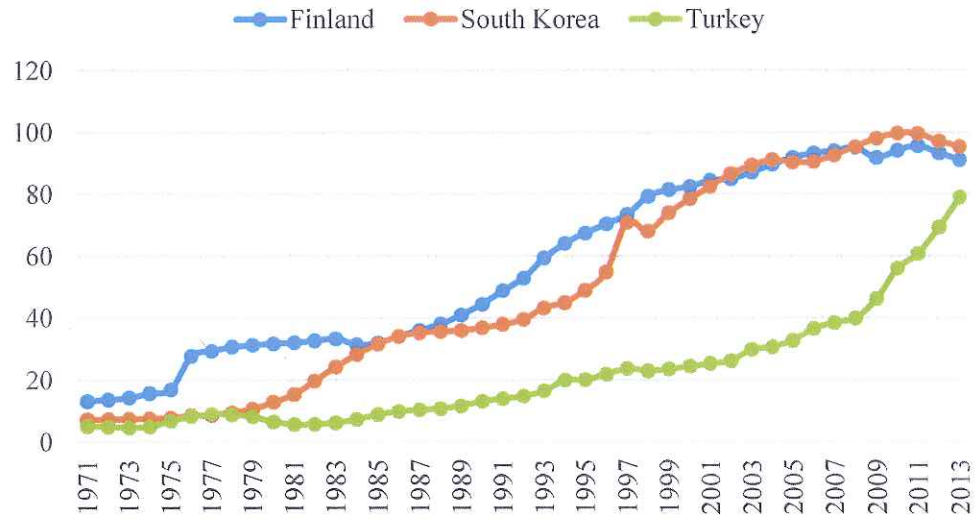
Source: World Bank - World Development Indicators

Figure 3.2: Secondary School Gross Enrollment Rates in Finland, South Korea and Turkey (%)



Source: World Bank - World Development Indicators

Figure 3.3: Tertiary School Gross Enrollment Rates in Finland, South Korea and Turkey (%)



Source: World Bank - World Development Indicators

According to the literature, the cointegration test is useful to determine the long run relationship between time series variables that are non-stationary. The cointegration test was found by Engle Granger (1987) and developed by Johansen (1988) and Johansen ve Juselius (1990).

In econometric analysis with non-stationary series, it is possible that the test will not yield correct results. It is possible to face with a spurious regression problem with non-stationary series (Granger and Newhold, 1974).

For a series to be stationary;

a) Fixed arithmetic mean: $E(Y_t)=\mu$

b) Constant variance: $Var(Y_t)=E(Y_t-\mu)^2=\sigma^2$

c) Covariance due to delay distance: $\gamma_k=E[(Y_t-\mu).(Y_{t-k}-\mu)]$ for all t values k=delay distance, conditions must be met (Tarı, 2010: 375).

Cointegration analysis provides ability to test the linear relationship between variables whether the series are non-stationary. According to cointegration

theory, if the series are not I(0) and the series are I(1)-I(1) or I(2)-I(2), then we have to check the error term series obtained from the estimation of regression at I(0). If the error term series (u_t) is stationary then we can say that there is a cointegration between these time series. (Tarı, 2010: 416)

Engle- Granger Cointegration test is made by using regression equation:

$$Y_t = b_0 + b_1 X_t + u_t \qquad (1)$$

From this regression equation, error term series are obtained:

$$u_t = \delta u_{t-1} + v_t \qquad (2)$$

In the second equation, Augmented Dickey Fuller (ADF) unit root test is used. If the error term series is stationary, then there is a cointegration relationship between the series. In this case, it is assumed that the series are moving together in the long run and that the estimates to be made of the level values of the series will not contain spurious regressions.

In the equation (1) b_1 is named as cointegration coefficient.

3.2. DATA SET AND EMPIRICAL APPLICATION

Data set for empirical estimation is obtained from the World Bank – World Development Indicators database. The data include the period between the years 1971 and 2013. In the database, GDP per capita is defined as gross domestic product divided by midyear population and data are in constant 2010 U.S. dollars. On the other hand, World Bank defines gross enrollment ratio as the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

GDP per capita in constant prices is used for economic growth while for education secondary and tertiary enrollment ratios are used separately. For missing values of Turkey, namely secondary enrollment rates in 1975, 1985, 1996, 1998

and tertiary enrollment rates in 1996 and 2000, the average value of previous year and the following year is used. All variables are in log form. Data used for Turkey are indicated below:

TURGDP: GDP per capita in constant prices

TURSEC: Gross enrollment ratio in secondary education

TURTER: Gross enrollment ratio in tertiary education

3.2.1. Unit Root Test

For the cointegration test, first the variables have to be controlled whether they are stationary or not at level. To test the situation of variables, we need to use unit root test for each variable.

Results for unit root test are in the table below:

Table 3. 2: ADF Unit Root Test for Turkey

Variable	ADF Test	Critical values		
		%1	%5	%10
TURGDP	-0.191 (0.9317)	-3.597	-2.933	-2.605
TURSEC	-1.002 (0.7440)	-3.597	-2.933	-2.605
TURTER	-1.924 (0.9997)	-3.616	-2.941	-2.609
ΔTURGDP	-6.504* (0.0000)	-3.601	-2.935	-2.606
ΔTURSEC	-5.605* (0.0000)	-3.601	-2.935	-2.606
ΔTURTER	-3.527** (0.0121)	-3.601	-2.935	-2.606

Note: The parentheses give the value of the probability. * and ** show 1% and 5% significance levels respectively.

According to unit root test, it is seen that all variables are non-stationary at level. When we take the first difference of the variables, they become stationary. This means that all variables are stationary at I(1). Therefore, it is possible to test cointegration between these variables.

3.2.2. Long Run Analysis

Before testing cointegration, we have to estimate the long run equation. To make the long run analysis, the level values of variables are used. The results of the ADF test are shown in the Table above, in which the stability of the series is checked and two series are stationary at I(1). Therefore, the necessary preconditions for cointegration can be achieved. The long-term model is adapted to work as follows:

$$TURGDP=\beta_0+\beta_1 TURSEC+u_t$$

$$TURGDP=\beta_0+\beta_1 TURTER+u_t$$

We analyze the secondary and tertiary education separately. Long-term equations are estimated with level values and u_t is obtained by estimating the series of error terms.

Firstly, the estimation results of the equation for secondary enrollment are given in the table below.

Table 3. 3: Long Run Analysis for Turkey (Secondary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
TURSEC	0.685	0.030	22.396	0.000
C	6.077	0.122	49.618	0.000
R^2		0.92		
Adjusted R^2		0.92		

According to the estimation results, the long run equation can be written as:

TURGDP= 6.07 + 0.68 TURSEC

Therefore, it can be said that a 1% increase in the secondary education ratio increases growth per capita by 0.68%.

Secondly, for tertiary enrollment, the estimation results of the equation are given in the table below.

Table 3. 4: Long Run Analysis for Turkey (Tertiary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
TURTER	0.349	0.009	39.009	0.000
C	7.843	0.025	304.935	0.000
R^2		0.97		
Adjusted R^2		0.97		

According to the estimation results, the long run equation can be written as:

TURGDP= 7.84 + 0.34 TURTER

Therefore, a 1% increase in tertiary education ratio will increase growth per capita by 0.34%.

3.3.3. Engle Granger Cointegration Analysis

Many macroeconomic variables may not be stationary at level values. However, if there is cointegration between the series, spurious regression problem will not be encountered in the analysis results to be made with the level values of the series. However, dynamic behaviors of long-term co-moving variables show some deviation from equilibrium relation. This is an essential feature of cointegrated variables and plays a decisive role in short-term dynamics. The dynamic model that emerges in this process is called the Error Correction Model (Peker and Göçer, 2012: 164).

A series of error terms were obtained from the long-run analysis and ADF unit root test was applied to this error series. The calculated test statistical results are larger than the critical value in the table as an absolute value, and it is seen that there is a cointegration relation between series. The test results were compared with the critical values of Engle-Granger (1987) and the results are given in the table.

Table 3. 5: Cointegration Analysis for Turkey

	ADF	Prob	Results
ECT(eq1)	-2.117	0.034	There is cointegration
ECT(eq2)	-3.765	0.006	There is cointegration

According to results in table 3.4, unit root tests of error terms from both equations show that it is significant at level 5%. Then it can be said that there is a cointegration relation between the series. Thus, it is seen that the series move together in the long run, and the analysis to be done with the series will not have a spurious regression problem.

3.4. ECONOMETRIC ANALYSIS FOR SOUTH KOREA AND FINLAND

The same way for econometric test is applied for South Korea and Finland as well. As in Turkey's analysis, the same period and variables are used for testing cointegration between education and economic growth.

3.4.1. Empirical Results for South Korea

In the analysis for South Korea, the variables are defined as follows:

KORGDP: GDP per capita in constant prices

KORSEC: Gross enrollment ratio in secondary education

KORTER: Gross enrollment ratio in tertiary education

According to South Korea's variable data, the results are shown in following tables.

Table 3. 6: ADF Unit Root Test for South Korea

Variable	**ADF Test**	**Critical values**		
		%1	**%5**	**%10**
KORGDP	-0.147 (0.9922)	-4.192	-3.520	-3.191
KORSEC	-0.701 (0.8630)	-2.622	-1.949	-1.612
KORTER	-1.713 (0.7271)	-4.198	-3.523	-3.193
ΔKORGDP	-6.327* (0.0000)	-4.198	-3.523	-3.193
ΔKORSEC	-2.379** (0.0185)	-2.622	-1.949	-1.613
ΔKORTER	-3.769** (0.0298)	-4.226	-3.536	-3.200

Note: The parentheses give the value of the probability. * and ** show 1% and 5% significance levels respectively.

The table shows that all variables for South Korea are stationary at I(1). Then, the long run equations can be written as:

$$KORGDP=\beta_0+\beta_1 KORSEC+u_t$$

$$KORGDP=\beta_0+\beta_1 KORTER+u_t$$

Firstly, the long run relationship between secondary education enrollment and growth is shown in the following table.

Table 3. 7: Long Run Anlysis for South Korea (Secondary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
KORSEC	2.513	0.261	9.620	0.000
C	-2.054	1.157	-1.775	0.083
R^2		0.69		
Adjusted R^2		0.68		

According to the estimation results, the long run equation can be written as:

KORGDP= -2.05 + 2.51 KORSEC

Therefore, a 1% increase in secondary education ratio will lead to an increase in per capita growth by 2.51%.

Secondly, the estimation results of the equation for tertiary enrollment are given in the table below.

Table 3. 8: Long Run for South Korea (Tertiary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
KORTER	0.801	0.024	32.536	0.000
C	6.197	0.091	68.160	0.000
R^2		0.96		
Adjusted R^2		0.96		

According to the estimation results, the long run equation can be written as:

KORGDP= 6.19 + 0.80 KORTER

Thus, a 1% increase in tertiary education ratio will increase growth per capita by 0.80%.

At the end, error correction test is applied by using residual series obtained from long run estimation.

Table 3. 9: Cointegration Analysis for South Korea

	ADF	Prob	Results
ECT(eq1)	-1.071	0.252	There is no cointegration
ECT(eq2)	-2.940	0.004	There is cointegration

Error correction model shows that secondary education enrollment is not cointegrated with economic growth for the case of South Korea. However, tertiary education enrollment is cointegrated with economic growth.

3.4.2. Empirical Results for Finland

In the analysis for Finland, the variables are defined as follows:

FINGDP: GDP per capita

FINSEC: Gross enrollment ratio in secondary education

FINTER: Gross enrollment ratio in tertiary education

The period contains the years 1971-2013. Moreover, all variables are in log form.

The unit root test results are shown in following table.

Table 3. 10: ADF Unit Root Test for Finland

Variable	ADF Test	Critical values		
		%1	%5	%10
FINGDP	-1.253 (0.9816)	-3.600	-2.935	-2.605
FINSEC	-1.320 (0.6114)	-3.596	-2.933	-2.604
FINTER	-1.331 (0.9999)	-4.252	-3.548	-3.207
ΔFINGDP	-3.906* (0.0044)	-3.600	-2.935	-2.605
ΔFINSEC	-4.616* (0.0006)	-3.600	-2.935	-2.605
ΔFINTER	-4.368* (0.0075)	-4.252	-3.548	-3.207

Note: The parentheses give the value of the probability. * show 1% significance level.

Table shows that all variables of Finland are stationary at I(1). Then, the long run equations can be written as:

$$FINGDP=\beta_0+\beta_1 FINSEC+u_t$$

$$FINGDP=\beta_0+\beta_1 FINTER+u_t$$

The long run relationship between secondary education enrollment and growth is shown in the following table.

Table 3. 11: Long Run Analysis for Finland (Secondary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
FINSEC	1.749	0.369	7.740	0.000
C	2.163	1.734	1.247	0.219
R^2		0.35		
Adjusted R^2		0.34		

According to the estimation results, the long run equation can be written as:

FINGDP= 2.16 + 1.74 FINSEC

Therefore, it can be said that a 1% increase in secondary education ratio increases growth per capita by 1.74%.

For tertiary enrollment, the estimation results of the equation are given in the table below.

Table 3. 12: Long Run Analysis for Finland (Tertiary Education)

Variable	Coefficient	Std error	t-Statistic	Prob
FINTER	0.431	0.023	18.375	0.000
C	8.711	0.092	94.458	0.000
R^2		0.89		
Adjusted R^2		0.88		

According to the estimation results, the long run equation can be written as:

FINGDP= 8.71 + 0.43 FINTER

Therefore, a 1% increase in tertiary education ratio will increase growth per capita by 0.43%.

At the end, error correction test is applied by using residual series obtained from long run estimation.

Table 3. 13: Cointegration Analysis for Finland

	ADF	Prob	Results
ECT(eq1)	-2.176	0.030	There is co-integration
ECT(eq2)	-2.842	0.005	There is co-integration

Error correction model shows that both secondary and tertiary education enrollment is cointegrated with economic growth for Finland.

3.5. RESULTS

We analyzed the relationship between education and economic growth for Turkey, Finland and South Korea. According to the results for Turkey and Finland, there is a cointegration for both secondary and tertiary education with economic growth.

However, the empirical results for South Korea differs from Turkey and Finland. The results for South Korea shows that there is a cointegration between tertiary education and economic growth. Nevertheless, for secondary education it is uncertain.

According to the regression results for all countries, education levels have positive impact on economic growth. The table shows the regression results for all countries together.

Table 3. 14: The Effects of Education on Economic Growth (A comparison between countries)

Variable	Coefficient	Std error	t-Statistic	Prob
TURSEC	0.684	0.030	22.39	0.000
TURTER	0.349	0.009	39.009	0.000
KORSEC	2.513	0.261	9.620	0.000
KORTER	0.801	0.024	32.536	0.000
FINSEC	1.749	0.369	7.740	0.000
FINTER	0.431	0.023	18.375	0.000

The effect of secondary school enrollment in Korea is higher than other two countries. Turkey has the least coefficient for secondary enrollment ratio. In Turkey, secondary education has been compulsory more recently. The secondary school enrollment ratios are relatively low as compared to other two countries. For instance, the secondary school enrollment in 1980 was 38% in Turkey. In Finland and in South Korea it was 98% and 77% respectively. In the last decade, the ratios were still higher in Finland and South Korea with respect to Turkey. These rates imply that the other countries have a more educated population in the last 3 decades. Especially South Korea became an outstanding country in the last 2 decades while improving its production technology and therefore the technology level of its exports. Increase in the technologhy level of manufacturing increased the need for more educated labor.

The effect of tertiary school enrollment on growth in Finland and South Korea is also higher than Turkey. In 1980, the tertiary school enrollment in Finland was 32% and in South Korea, it was 13%. However, in Turkey it was only 6%. In 2000, the ratio for South Korea reached 78% and in Finland 82%. Whereas in Turkey, it was only 24%. South Korea showed great performance in tertiary

education. In 2010, the tertiary school enrollment in South Korea reached almost 100% but in Turkey, it was only about 56%.

CONCLUSION

In this study, we searched for the relationship between education and economic growth. Education, as a primary source for human capital, is important to improve the abilities and skills of individuals and finally society as a whole. As the production forms change and the level of technology is developed, economies need more labor that is educated. Education is not only a way of giving information, but also helps people to acquire knowledge, skills and a better comprehension of the world.

The analysis included the secondary and tertiary education level because in these education levels young people start to choose their way for the future. Moreover, they usually learn more complicated information that will be used in their professional life.

In the literature, several studies focus on the relationship of education and economic development. Some studies used school enrollments or number of graduated students to understand the effect of education on economic growth.

In this study, the secondary and tertiary school enrollment ratios are used to understand the effect on economic growth. The fundamental research was for Turkey, but other two countries, South Korea and Finland, are also included in the empirical analysis to compare the results with Turkey. The Engle Granger cointegration analysis is used for all countries. The results show that in Turkey, both education levels have positive impact on economic growth and the variables have a long-run relationship. The empirical results for South Korea and Finland also show that education has a positive impact on economic growth. However, for secondary education level there is no significant cointegration with economic growth in South Korea. In the long run, there is a cointegration between tertiary

school enrollment and GDP. For Finland, both at secondary and tertiary education level there is significant cointegration with economic growth.

At the end, we compared the results between three countries. The results showed that education is more effective on economic growth in South Korea and Finland than in Turkey. Since education is a long run process, it may have a positive impact in the long run. It seems that these countries attached importance to education earlier than Turkey. Therefore, their relatively stronger economic performance in terms of GDP per capita could be linked to education to some extent. Besides other factors, the effect of institutional and cultural factors across countries may also have differentiated the effect of education on the economy.

In the case of Turkey, the education system is still a controversial issue. However, as the government gives more importance to education in terms of not only the quantity of schools but also the quality, and supports and encourages educational institutions, this will eventually result in positive impact on economic development. Furthermore, it is seen that enrollment rates of Turkey has succeeded in catching up with the other two countries which implies that it is possible for Turkey to see the benefits of increasing enrollments in the next few decades.

In most of the countries, enrollment rates have reached a certain level. But national development plans have still some targets for enrollment rates. Access to education maintains its importance worldwide. On the other hand, measuring education with figures that are based on head counts could be regarded as inadequate. Because quality is evaluated as a determinant of influence of education. Even United Nations has evolved its goal regarding achieving universal primary education in Millennium Development Goals to ensuring inclusive and quality education for all and promoting lifelong learning in Sustainable Development Goals (also known as Global Goals). Comparing countries' economic performance based on their success on education in terms of policies and ability, knowledge and skills of students seems more reasonable. Therefore, for further studies it is important to focus on the relationship between measures regarding quality of education and economic indicators.

REFERENCES

Akalın, G. (2000) *Kamu Ekonomisi*, Ankara: Çağ Yayınları

Akçacı, T. (2013), Eğitim Harcamalarının İktisadi Büyümeye Etkisi, *Kafkas Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 4 (5), 65-79

Akgül, I. ve S. Ö. Koç (2011), Türkiye Cumhuriyeti Tarihinde Eğitim ve Büyüme İlişkisi: Eşik Otoregresif Yaklaşım, *Trakya Üniversitesi Sosyal Bilimler Dergisi*, 13(2), 1-36

Akyüz, Ö. F. (2001), *Stratejik İnsan Kaynakları Planlaması*, İstanbul: Sistem Yayıncılık

Asteriou, D., and Agiomirgianakis, G. (2001). Human capital and economic growth, Time series evidence from Greece, *Journal of Policy Modeling*, 23, 481-489

Barro, J. B. (1991), Economic Growth in a Cross Section of Countries, *The Quarterly Journal of Economics*, 106(2), 407-443

Barro, R. J. (1999). Human capital and growth in cross-country regressions. *Swedish Economic Policy Review 6*(2), 237-277

Barro, R. J. (2001), "Human Capital and Growth", *American Economic Review,* 91(2), 12–17

Bartolo, A.D. (1999), "Human Capital Estimation through Structural Equation Models with some Categorical Observed Variables", *Prepared for the Intenational Workshop on Correlated Data: Estimating Function Approach,* Trieste- Italy (22-23 October 99)

Benhabib, J. and Spiegel, M. M. (1994) The Role of Human Capital in Economic Development Evidence From Aggregate Cross-Country Data Journal of Monetary Economics, 34, 143-173

Blankenau,W. F., N. B. Simpson ve, M. Tomljanovich (2007), Public Education Expenditures , Taxation and Growth: Linking Data To Theory, *American Economic Association*, 97(2), 393-397

Boratav, K. (2013) *Türkiye İktisat Tarihi 1908-2009*, Ankara: İmge Kitabevi

Brasseul, J. (1997*) Histoire des Faits Economiques de l'Antiquite a a Revolution Industrielle, Tome l*, Paris: Armand Colin

Council of Higher Education (2017 April 23*) Higher Education Information Management System, Student Figures Summary Table* Retrieved from https://istatistik.yok.gov.tr/yuksekogretimIstatistikleri/2017/2017_T1.pdf

Çakmak, E. ve S. Gümüş (2005), Türkiye'de Beşeri Sermaye ve Ekonomik Büyüme: Ekonometrik Bir Analizi (1960-2002), *Ankara Üniversitesi SBF Dergisi*, 60(1), 59-72

Çalışkan, Ş., Karabacak, M. and Meçik, O. (2013) Türkiye'de Eğitim- Ekonomik Büyüme ilişkisi: 1923-2011(Kantitatif yaklaşım), *Yönetim Bilimleri Dergisi,* 11(21), 29-48

Çoban, O. (2004) Beşeri Sermayenin İktisadi Büyüme Üzerine Etkisi: Türkiye Örneği, *İ.Ü. Siyasal Bilgiler Fakültesi Dergisi*, 30, 131-142

Deyon, P. (1969) *Le Mercantilisme*, Paris: Flammarion

Engle, R. F. and Granger, C. W. (1987) Co-integration and Error Correction Representation, Estimation, and Testing, *Econometrica*, 55, 251-276

Ergen, H. (1999) Türkiye'de Eğitimin Ekonomik Büyümeye Katkısı, *Ekonomik Yaklaşım*, 10(35), 21-56

Fuente, A. and Cicone, A. (2003) *Le Capital Humain dans une Economie Mondiale Fondee sur la Consaissance*, Luxemburg: Office des Publications Officielles des Communatues Europeennes

Granger, C. W. Ve Newbold, P. (1974) Spurious Regressions in Econometrics, *Journal of Econometrics*, 2(2), 111-120

Johansen, S. (1988) Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamic and Control*, 12, 231-254

Johansen, S. and Juselius, K.(1990) Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, 52, 169-210

Hanif, N. and Arshed, N. (2016) Relationship between School Education and Economic Growth: SAARC Countries, *International Journal of Economics and Financial Issues,* 6(1), 294-300

Kar, M. and Ağır, H. (2006) "Türkiye'de Beşeri Sermaye ve Ekonomik Büyüme İlişkisi: Eşbütünleşme Yaklaşımı ile Nedensellik Testi, 1926- 1994", *Selçuk Üniversitesi İ.İ.B.F. Sosyal ve Ekonomik Araştırmalar Dergisi*, 11, 51-68

Karataş, M. and E. Çankaya (2011) Türkiye'de Beşeri Sermaye ve Ekonomik Büyüme İlişkisinin Analizi, *Yönetim ve Ekonomi Dergisi*, 18(1), 105-214

Kaynak, T., Adal, A., and Ataay, İ.(2000) *İnsan Kaynakları Yönetimi*, İstanbul: İstanbul Üniversitesi İşletme Fakültesi

Kıran, B. (2013), "Testing the Impact of Educational Expenditures on Economic Growth: New Evidence from Latin American Countries", *Quality and Quantity.* 47, 1-10

Krueger, A.B., and Lindahl, M. (1999) Education for Growth in Sweden and the World, *NBER Working Papers Series,* 7190

Li, J. and L. Kong (2012) Equilibrium Relationship between Education And Economic Growth, *Advances in Applied Economic and Finance*, 2(3), 403-406

Lucas (1988) Lucas, R. E. (1988) On the Mechanics of Economic Development, *Journal of Monetary Economics,* 22, 3-42

Malthus, T. R. (1836) *Principles of Political Economy*, London: W. Pickering

Mankiw N. G., Romer, D. and, Weil, D. N. (1992) A Contribution to the Emprics of Economic Growth, *Quarterly Journal of Economics*, 107, 407- 437

Mincer, J.(1991) Education and Unemployment, *NBER Working Papers Series*, 3838

Nasir, Z. M. and Nazli, H. (2000) Education and Earnings in Pakistan, *Pakistan Institute of Development Economics*, 177

Özsoy, C. (2009) Türkiye'de Eğitim ve İktisadi Büyüme Arasındaki İlişkinin VAR Modeli ile Analizi, *Bilgi Ekonomisi ve Yönetimi Dergisi*, 4(1), 71-83

Öztunç, H., OO, Z. C., Serin, Z. V. (2015) Effects of Female Education on Economic Growth: A Cross Country Empirical Study, *Educational Sciences: Theory and Practice,* 15(2), 349-357

Öztürk, N. (2005) İktisadi Kalkınmada Eğitim Rolü, *Sosyoekonomi Dergisi*, 1, 27-44

Peker, O. and Göçer, İ. (2012) Bütçe Açıklarının Amprik Analizi, *Yönetim ve Ekonomi*, 19(1), 163-178

Riasat, S., Atif, R. M., and Zaman, K. (2011) Measuring the Impact of Educational Expenditures on Economic Growth: Evidence from Pakistan, *Educational Research,* 2(13), 1839-1846

Romer, P.M. (1990) Endogenous Technological Change, *Journal of Political Economy*, 98(5), 71-102

Rosenzweig, M.R.(2010). *Microeconomic Approaches to Development: Schooling, Learning, and Growth*, New Haven: Yale University Economic Growth Center

Saxton, J.(2000), "Invesment In Education: Private and Public Retuns", *Joint Economic Committee United States Congress*, 1-13

Schultz, T. W. (1971*) Investment in Human Capital: The Role of Education and of Research*, New York: Free Press

Serel, H. and K. Masatçı (2005) *Türkiye'de Beşeri Sermaye ve İktisadi Büyüme İlişkisi: Ko-Entegrasyon Analizi*, Atatürk Üniversitesi İ.İ.B.F. Dergisi, 19(2), 49-58.

Serin, N. (1972*) Eğitim Ekonomisi*, Ankara: AÜ Eğitim Fakültesi

Şimşek, M. and Kadılar, C. (2010) Türkiye'de Beşeri Sermaye, İhracat ve Ekonomik Büyüme Arasındaki İlişkinin Nedensellik Analizi, *Cumhuriyet Üniversitesi İ.İ.B.F. Dergisi*, 11(1), 115-140

Tarı, R. (2010) *Ekonometri*, Umuttepe Kitabevi: Kocaeli Üniversitesi

Tezcan, M. (1992) *Eğitim Sosyolojisi*, Ankara: Zirve Ofset

TÜİK (2017 April 20*) Education Statistics*, retrieved from http://www.tuik.gov.tr/PreTablo.do?alt_id=1018

UNESCO (2012) *International Standard Classification of Education ISCED 2011,* UNESCO Institute for Statistics, Canada

Ünal, I. (1993) Eğitimin Ekonomik Rolü ve Türkiye ile İlgili Bulgular

Yardımcı, P. (2006); *İçsel Büyüme ve Türkiye'de İçsel Büyümeyi Etkileyen Faktörlerin Ampirik Analizi,* Yayınlanmamış Doktora Tezi, Selçuk Üniversitesi S.B.E., Konya

APPENDIX

Data used for tests

Turkey

Year	GDP per capita (constant 2010 US$)	Gross school enrollment, secondary (%)	Gross school enrollment, tertiary (%)
1971	4,184.22	26.12	5.10
1972	4,388.06	28.18	4.83
1973	4,423.09	28.93	4.70
1974	4,560.01	28.97	4.92
1975	4,773.29	30.57	6.85
1976	5,152.32	32.18	8.32
1977	5,208.41	34.26	8.98
1978	5,169.13	36.24	8.80
1979	5,022.04	36.47	8.14
1980	4,788.28	38.46	6.58
1981	4,905.63	37.63	5.68
1982	4,963.23	38.45	5.76
1983	5,091.02	38.98	6.27
1984	5,312.47	40.42	7.32
1985	5,420.69	42.40	8.95
1986	5,684.16	44.38	9.90
1987	6,103.93	45.71	10.42
1988	6,130.85	47.56	10.79
1989	6,039.72	49.73	11.72
1990	6,485.94	50.29	13.17
1991	6,423.81	51.98	14.04
1992	6,638.29	53.59	14.80
1993	7,033.25	57.01	16.48
1994	6,600.02	58.64	19.96
1995	7,008.85	61.29	20.10
1996	7,408.45	61.17	21.89
1997	7,845.45	61.05	23.68
1998	7,902.14	65.91	22.93
1999	7,519.66	70.77	23.51
2000	7,909.16	72.72	24.39
2001	7,349.00	82.86	25.26

2002	7,689.00	87.44	26.20
2003	7,979.37	89.33	29.83
2004	8,607.45	86.24	30.63
2005	9,208.64	83.43	32.75
2006	9,722.50	87.45	36.58
2007	10,057.72	89.95	38.48
2008	10,004.69	88.29	39.93
2009	9,399.36	79.89	46.21
2010	10,111.19	84.20	56.00
2011	10,817.72	88.31	60.73
2012	10,851.23	85.11	69.30
2013	11,102.29	100.28	78.98

Source: World Bank - World Development Indicators

South Korea

Year	GDP per capita (constant 2010 US$)	Gross school enrollment, secondary (%)	Gross school enrollment, tertiary (%)
1971	2,122.78	39.71	7.25
1972	2,218.97	43.29	7.34
1973	2,502.46	46.57	7.41
1974	2,690.75	50.54	7.54
1975	2,840.01	54.39	7.73
1976	3,171.12	58.69	8.49
1977	3,491.02	62.97	8.76
1978	3,792.46	66.62	9.43
1979	4,048.75	70.86	10.62
1980	3,910.77	76.85	12.83
1981	4,135.30	81.84	15.34
1982	4,409.50	82.52	19.62
1983	4,874.27	84.30	24.25
1984	5,289.16	88.68	28.30
1985	5,628.62	90.58	31.59
1986	6,255.02	92.05	34.10
1987	6,953.42	93.85	35.25
1988	7,688.56	92.16	35.70
1989	8,126.92	92.49	35.92
1990	8,795.43	92.62	36.87

1991	9,554.68	92.32	37.93
1992	10,001.06	92.41	39.50
1993	10,526.59	94.96	43.30
1994	11,335.34	99.03	44.98
1995	12,224.04	101.26	48.93
1996	12,978.21	103.63	54.85
1997	13,598.51	104.26	64.51
1998	12,729.28	100.00	68.04
1999	13,995.38	99.07	73.90
2000	15,104.52	98.39	78.44
2001	15,671.61	95.19	82.47
2002	16,742.77	91.87	86.49
2003	17,148.48	90.01	89.26
2004	17,921.29	90.17	91.02
2005	18,586.29	92.98	90.30
2006	19,453.83	97.30	90.46
2007	20,421.39	99.14	92.58
2008	20,848.55	99.18	95.26
2009	20,896.45	98.16	97.97
2010	22,151.21	95.86	99.66
2011	22,796.47	95.49	99.52
2012	23,214.12	95.94	97.12
2013	23,784.09	97.73	95.35

Source: World Bank - World Development Indicators

Finland

Year	GDP per capita (constant 2010 US$)	Gross school enrollment, secondary (%)	Gross school enrollment, tertiary (%)
1971	18,784.24	101.84	13.13
1972	20,117.20	105.86	13.65
1973	21,400.27	106.22	14.29
1974	21,977.54	107.16	15.73
1975	22,275.12	106.28	16.95
1976	22,284.55	88.58	27.65
1977	22,275.53	91.81	29.40
1978	22,860.18	94.11	30.69
1979	24,425.75	96.92	31.29
1980	25,662.12	98.30	31.76

1981	25,883.75	99.66	32.15
1982	26,533.79	100.72	32.67
1983	27,199.33	101.11	33.40
1984	27,923.95	103.99	31.49
1985	28,791.20	104.94	31.96
1986	29,480.18	105.73	34.11
1987	30,442.94	106.00	36.08
1988	31,936.01	108.27	38.13
1989	33,439.88	111.23	41.02
1990	33,516.92	114.57	44.50
1991	31,362.82	116.42	48.93
1992	30,150.23	119.67	52.99
1993	29,784.32	116.55	59.43
1994	30,824.44	117.34	64.08
1995	31,998.91	115.56	67.49
1996	33,061.07	115.92	70.44
1997	35,023.67	117.75	73.50
1998	36,827.04	117.65	79.28
1999	38,374.51	120.58	81.49
2000	40,452.78	124.76	82.44
2001	41,402.41	127.32	84.43
2002	41,996.19	128.98	84.96
2003	42,731.57	131.74	87.08
2004	44,280.48	110.91	89.66
2005	45,355.96	111.97	91.83
2006	47,014.46	111.61	93.29
2007	49,242.13	110.33	93.98
2008	49,366.64	108.74	95.07
2009	45,068.44	107.42	91.83
2010	46,205.17	107.27	94.12
2011	47,173.83	107.48	95.60
2012	46,280.31	107.49	93.28
2013	45,718.37	143.22	91.07

Source: World Bank - World Development Indicators