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THE EFFECT OF EUROPEAN UNION MEMBERSHIP ON WELFARE

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To my parents and my little niece Yağmur Esila

APPROVAL PAGE

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1. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

2. The program of advanced study of which this thesis is part has consisted of:

i) Research Methods course during the undergraduate study

ii) Examination of several thesis guides of particular universities both in Turkey and abroad as well as a professional book on this subject.

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ABSTRACT

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The Effect of European Union Membership on Welfare

Firstly, European Union (EU) aims that its members reach to high welfare level. Increase in income, longevity and welfare can be seen in member countries after accession. So, the impact of union affiliation is analyzed with the help of the concept of full income and convergence theory between 1980 and 2009. According to findings, the new members tend to catch up to level of the developed EU countries thanks to the economic opportunities provided by EU. The members gain economic welfare initially and as a result of this, longevity and social welfare start to increase. Although not seen an increase as much as the income, the average life expectancy of member is increasing and the short-lived members tend to enhance their longevity faster than the long-lived countries. As a result, it is shown that the welfare level increases with the impacts of increasing income and longevity and there is convergence among EU countries in terms of income, longevity and welfare.

Key words:
European Union, Convergence, Full Income, Welfare

KISA ÖZET

Ender SEVİNÇ **Haziran 2011**

Avrupa Birliği Üyeliğinin Refah Üzerindeki Etkisi

Avrupa Birliği (AB), üyelerini yüksek refah seviyesine ulaştırmayı amaçlamaktadır. Üye ülkelerde, özellikle birliğe katılmalarından sonra gelir, ömür ve refah açısından artışlar gözlemlenmektedir. Bu sebeple, birlik üyeliğinin, üye ülkeler üzerindeki etkisi, full income kavramı ve yakınsama teorisi yardımıyla 1980-2009 seneleri arasında analiz edilmiştir. Bulunan sonuçlara göre; özellikle yeni üyeler AB tarafından sunulan ekonomik imkânlar yardımıyla gelişmiş ülkeler seviyesine erişmeyi amaçlamaktadırlar. AB üyeleri öncelikli olarak ekonomik refaha erişmekte ve bunun sonucu olarak ömür ve sosyal refahta artışlar gerçekleşmektedir. Her ne kadar gelirdeki kadar fazla bir artış görülmesede, düşük ömürlü ülkelerin ortalama ömürlerinin uzun ömürlü ülkelere nazaran daha hızlı arttığı gözlemlenmiştir. Sonuç olarak, artan gelir ve ömrün etkisiyle üye ülkelerin refah seviyeleri artış göstermekte ve üye ülkeler arasında bu üç kavram açısından yakınsama olduğu gösterilmiştir.

Anahtar Kelimeler

Avrupa Birliği, Yakınsama, Full Income, Refah

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LIST OF ABBREVIATIONS

EU	European Union
EEC	European Economic Community
EAEC	European Atomic Energy Community
EC	European Commission
EFTA	European Free Trade Area

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INTRODUCTION

The societies try to find the way of reaching to higher level living standards. In this way, many economic, social and technological indicators can be effective in the course of this aim. Undoubtedly, the economic power has a crucial role to reach to level of high welfare. It is proposed that the members can reach to high welfare level with the help of advantages of membership such as, strong economy, common market, abolition of borders and transferring of capitals and technology provided by EU.

Increase in life expectancy is a consequence of increasing income, because the rich individual will give up much money for increasing longevity (Rosen, 1988). The quality of life can be raised with the effects of economic advantages of union affiliation and as a result of this; it is proposed that the quantity of life can be increased with the help of increasing heath expenditures and transferring of technology in EU. So, the main effective factors in welfare are not only the level of per capita income but also the life span (Becker at al., 2005)

There is a positive relationship between health conditions and income level (Barro & Sala-i Martin, 2004, Becker et al. 2005). At the same time the income level is a factor of increasing the health expenditures and conditions (Murphy & Topel, 2003). The welfare level starts to increase with the effect of increasing income level and the labour can have an effective role in economy with the help of enhancing welfare and health conditions (Kutan & Yiğit, 2007). Thus, the societies which have high health conditions and are effective in economy reach to high income, longevity and welfare level.

On the other hand, the EU membership is beneficial with the institutionalization besides the economic opportunities. Many studies showed that institutes are key factors for the health status of a society (Baum et al., 2003). The good institutions increase the health conditions of societies. Besides, income inequality affects the health status of societies negatively, but it can be prevented

with the help of good institutions (Drabo, 2010). It can be said that, EU can be effective on institutions of members besides the economic acquisitions. As a result of this, the income inequality in union reduces and health status and income level of members increases. The social welfare starts to increase with the help of these factors.

As it is known that there are many factors which affect the welfare positively or negatively, so the identification of welfare function is complex in real. The welfare can be defined with respect to per capita income and longevity. So, the welfare can be identified as a function of income and longevity. However, a measurement can be needed for defining the life expectancy in terms of income. In this point, the concept of full income helps to obtain the monetary value of life expectancy. Thus, the welfare can be written in terms of per capita income and the effect of union affiliation in welfare can be analyzed with the help of convergence theory.

This thesis is organized as follows. In chapter 1, the information about the history of EU will be given and the opportunities provided by EU will be analyzed. In chapter 2, the income convergence will be tested among EU countries. In chapter 3, the life expectancy alteration of EU members and the existence of life expectancy-convergence will be investigated between 1980 and 2009. In chapter 4, the concept of full income which gives the monetary value of lifetime will be defined and the effect of EU on welfare will be analyzed with the help of convergence theory. Finally, in conclusion the results will be discussed.

CHAPTER 1

A HISTORICAL OVERVIEW OF EUROPEAN UNION

European Union (EU) is an association which was established by the countries having common aim, policy and market etc. The decision of integration goes back to second half of the 19th century and today, EU is a developed international union. The main aim of EU is establishing an economic and social corporation. So, EU gains strength with the new members for achieving the purpose of generating a common policies and single market. EU, which started with a small coal and steel single market, showed an extremely successful development in past decades (Dinan, 2004).

1.1 The Brief History of European Union

Though the idea of merger went back to 19th century, the concrete steps for integration was taken in the second half of 20th century. The integration process started in 1951 and the Treaty of Rome which established European Economic Community (EEC) and European Atomic Energy Community (EAEC) entered into agreement on 25th March 1957 by first founder countries (Belgium, France, The Netherlands, Luxemburg, Germany and Italy).

The one of the most important constituents of union was establishment of a single market and this idea occurred with the abolishment of the tariffs on 1st July 1968.

In 1973, the first enlargement was occurred and Denmark, United Kingdom and Republic of Ireland joined to union.

In 1981, the number of the member countries raised to 10 with accession of Greece to union. After that, these ten countries decided to accelerate the EU integration process.

In 1986, the third enlargement was occurred and Portugal and Spain joined to union.

The Maastricht Treaty, which was signed on 7 February 1992 and came into force in 1993, was a milestone for EU, because the term of "European Union" was used firstly.

In 1995, Austria, Finland and Sweden joined and the number of members reached to 15. As of the date of Maastricht Treaty, the effort of many European countries for being member of EU has increased, because EU have provided many advantages to member countries.

In 2004, ten countries joined to EU (Czech Republic, Estonia, Cyprus, Lithuanian, Latvia, Hungry, Malta, Poland, Slovak Republic and Slovenia) and the number of EU member reached to 25.

In 2007, Bulgaria and Romania became a member of EU with last enlargement and EU has 27 member countries today.

Also, five candidate countries, which are Croatia, Iceland, Montenegro, Macedonia and Turkey, wait for being a part of EU.

1.2 The Advantages of EU

The EU aims to maintain the economic and social integration and to achieve a sustainable development. This is expected that the main macroeconomic policies of this union are effective on new member countries' economic development. Also, the candidate countries probably reach a higher level of their own economics thanks to this union's economic development policies. For example, the new member countries enjoy the subvention of EU, so it is expected that the per capita income of these countries can be increased. Because of this reason, it is possible to speak about the convergence between EU countries. In addition to economic integration, EU is a political association that it aims to establish a monetary union, to strengthen the federal structure, to follow a common foreign policies and security policies, and to provide a corporation in domestic affairs and law. The common currency, which is

EURO, affects the markets positively, because of increasing the dependability of EU common market with price stabilization, developing investment facilities and making easier to enter common market (Özbay, 1997). Unique currency provides the achievements of the common market, because of the increasing competition between producers (Karluk, 1998)

The first effects of EU membership can be seen in economic fields. Firstly, EU aims to achieve a sustainable economic growth for new members. One of the primary aims is the increasing of the employment in the way of social policies for EU and member countries (Kar & Arıkan, 2003) Also, EU follows some policies which provides to development on labour force, encourages the firms for new investments and technologies, and provides effective producing structures. So, EU countries can invest easily to member countries. Because of the single market, the capitals, labour, technology can be transferred freely and an effective producing and low price can be provided (Macdonald, 1994, Caves & Barton, 1990, Lee, 1992). This tends to improve the technology and reach to high welfare thanks to high real income in the union (Kar & Arıkan, 2003). EU has low unemployment rate, inflation, public deficit, high investment rate, competitive and strong market structure today (Dinan, 2004). It offers a high living standards and welfare and strong economic structure to its members. European Union economics is the largest economy in the world now. So, many countries want to be a part of this union because of these economic and social gains.

Kutan and Yiğit (2007) reported that after joining to union, the EU countries' productivity growth rate is increasing and the post-accession economic growth is increasing due to Structural Funds and Cohesion Funds.

Badinger (2005) noted that EU membership is extremely effective on post-war economic activities of EU member states. Henrekson et al. (1997) showed the positive and significant correlation between economic growth and EC and EFTA membership.

Some studies show that the income has a major impact of a society's overall welfare (Agan, Sevinc & Orhan 2009). So, it is expected that the welfare level of new member countries can be rising due to increasing per capita income. Also, it is possible that the health expenditures can be increased because of increasing per capita income. So, it can be said that firstly the new countries joined to union is influenced economically and the economic welfare increases, later the welfare of society and living standards increase in the long run.

CHAPTER 2

ECONOMIC CONVERGENCE

The term of convergence has been discussed in many studies. Many studies have used this concept and applied to many regions in the world such as, European Union regions, U. S. States and OECD countries. It is clearly understood that the convergence or catching up can be observed in regions or countries which benefit from same opportunities or are member of same corporation, union etc.

The principal definition of convergence is given by Barro and Sala-i Martin (1992) with showing the existence of the convergence across US states between 1880 and 1988. Barro and Sala-i Martin (2004) defined the concept of convergence that initial level of per capita income is inversely correlated with its growth rate and the high income economies grow slower than the low income economies. This is defined as β convergence.

Barro and Sala-i Martin (2004) defined the σ convergence as decreasing dispersion of per capita GDP. The dispersion can be test with cross-sectional standard deviation of the logarithm of real GDP per capita or coefficient of variation which is the standard deviation over the mean of the sample. Sala-i-Martin (1995) and Quah (1993) showed that σ convergence is not required but adequate condition for β convergence.

Barro and Sala-i Martin (2004) defined the unconditional (absolute) β convergence that the high income economies grow slower than the low income economies without effects of some control variables of economies, whereas they are taken into account with conditional β convergence. In unconditional convergence theory, it is assumed that the samples converges a unique steady state level and all variables affects the steady state positions of economies evenly (Barro & Sala-i Martin, 2004). In conditional convergence theory, each economy converges its own steady state levels, so different steady state levels for each economies and the

existence of control variables which affect the steady state levels of economies differently are considered (Barro & Sala-i Martin, 2004).

The concept of convergence may vary from economy to economy, because it is highly related with the steady state level of the economies. As long as an economy is getting closer to its steady state level, the convergence rate slows down. The growth rate of an economy decreases in time because of diminishing returns (Barro & Sala-i Martin, 2004).

2.1 Economic Convergence in EU

Table 2.1 shows the economic growth rate of EU and member countries. The growth rates are shown periodically. Some members do not have data for 1980-1989 period, so the growth rate in the period of 1980-2009 implies the growth rate in the period of 1990-2009 for countries having missing data. According to table, the economy of European Union (EU) expanded by 77% between 1980 and 2009, also the economy continues to grow day by day with the participation of new countries and the further development of the European single market. The growth rate of EU economy is 23 % in the period of 1980-1989, 19% in the period of 1990-1999 and 11% in the period of 2000-2009. As shown with these results, despite the addition of new members and expansion of economic borders, the growth rate of EU economy tends to decrease. While the EU economy is growing, the growth rate is decreasing. This shows the existence of the convergence among 27 members of EU.

When taking a look at some EU countries, the economic recovery is seen easily. Czech Republic joined to EU in 2004 and it can be seen that the period of 1990-1999 was distressed for Czech economy. However, Czech Republic managed to achieve to reach growth of 33% between 2000 and 2009 also 20% of this economic growth was took place after being a member of the union.

Table 2.1: The Growth Rate of Economies in EU (1980-2009)[1]

	1980-1989	1990-1999	2000-2009	1980-2009
European Union	0.2362	0.1995	0.1195	0.7724
Austria	0.1890	0.2380	0.1420	0.8151
Belgium	0.1831	0.2016	0.1225	0.7064
Bulgaria	0.3978	-0.1620	0.4945	0.6822
Cyprus	0.7046	0.4316	0.3202	2.6347
Czech Republic		-0.0104	0.3363	0.3706
Denmark	0.2086	0.2481	0.0551	0.6743
Estonia	0.2743	-0.1362	0.4437	0.6180
Finland	0.3447	0.1636	0.1621	0.9256
France	0.2353	0.1705	0.1091	0.7103
Germany	0.1960	0.1931	0.0518	0.6303
Greece	0.0708	0.2065	0.3339	0.8004
Hungary	0.1605	0.0248	0.2209	0.4884
Ireland	0.3159	0.8135	0.3134	2.7207
Italy	0.2430	0.1287	0.0141	0.5056
Latvia	0.4076	-0.2968	0.4317	0.3947
Lithuania		-0.3020	0.5052	0.0847
Luxembourg	0.5394	0.5072	0.2867	2.4097
Malta	0.3795	0.5313	0.1171	1.6657
Netherlands	0.1966	0.3139	0.1202	0.9072
Poland		0.3918	0.4101	1.0460
Portugal	0.3248	0.2873	0.0529	0.9398
Romania	0.1381	-0.1750	0.5113	0.3676
Slovak Republic	0.1092	0.0285	0.5181	0.7557
Slovenia		0.1464	0.2921	0.5463
Spain	0.2867	0.2544	0.2294	1.1634
Sweden	0.2323	0.1775	0.1625	0.7795
United Kingdom	0.2973	0.2361	0.1408	0.9159
Source: World Bank				

It is known that 1990s was distressed for Europe, especially East European countries. The decrease of GDP in some country can be seen easily in 1990-1999 period. Estonia became a part of the union in 2004 and Estonia's economy grew by 27% from 1980 to 1989, whereas the growth decreased sharply in 1990s. Estonia

[1] **Source:** Author's own calculations

achieved to develop its economy and especially the economy started to increase sharply after joined to union. In the 2000-2009 period, Estonia achieved to reverse this retrogressive trend thanks to EU's economic advantages and grew by 44%. As another example, Latvia and Lithuania, which joined the union in 2004, grew admirably. Lithuania's economy developed by 50% and Latvia's economy grew by 43% from 2000 to 2009. In addition to these examples, Slovak Republic's economy was managed to expand by 51%, Slovenia's economy was expanded by 29% and Hungary's economic growth rate was 22% in 2000-2009 period.

Portugal and Spain are members of EU since 1986 and they benefited effectively from economic advantages offered by EU and managed to develop their economies. Portugal's economy grew by 32% in the period of 1980-1989, by 28% in the period of 1990-1999 and it grew by 5% from 2000 to 2009. Portugal achieved to develop its economic activities by 78% since being a member of EU. In the same way, Spain's economy grew by 28% from 1980 to 1989, 25% in the period of 1990-1999 and 22% between 2000 and 2009. Spain's economic growth rate was 95% from 1986 to 2009. As is seen, the data shows that EU membership is so effective for member countries' economies.

Table 2.2: Statistics of GDP per Capita (1980-2009)[2]

	1980 - 1989		**1990 - 1999**		**2000 - 2009**	
Minimum	1332.11	1858.95	1720.27	1456.36	1563.19	2569.99
Maximum	20962.35	31183.34	32476.71	43420.52	46456.62	54843.62
Mean	11018.96	13360.34	12400.49	14800.35	15458.13	18254.51

Table 2.2 represents the some statistics of real GDP per capita. According to these data, the minimum real GDP per capita reached to 2570$ in 2009 which was 1332$ in 1980. It is seen that the minimum income decreased to about 1400 in 1990s, and then it began to increase in the beginning of 2000s. Maximum per capita income increased from 20962 to 54843 between 1980 and 2009. According to statistics, the

[2] **Source:** Author's own calculations

maximum income per capita was not affected as much as the minimum income per capita in 1990s. The average real GDP per capita increased from 11018 to 18254 in thirty years. As shown in statistics, the income per capita of EU economies decreased in 1990s and it achieved a large growth in 2000s.

Table 2.3: Statistics of the Logarithm of GDP per Capita (1980-2009)[3]

	1980 - 1989		1990 - 1999		2000 - 2009	
Minimum	7.194	7.527	7.450	7.283	7.354	7.851
Maximum	9.950	10.347	10.388	10.678	10.746	10.912
Mean	9.062	9.253	9.147	9.259	9.304	9.552
Standard Deviation	0.8139	0.8018	0.8260	0.9432	0.9390	0.7915
Coefficient of Variation	0.0898	0.0866	0.0903	0.1018	0.1009	0.0828

Table 2.3 represents the some statistics of the logarithm of real GDP per capita. According to statistics, the standard deviation of the samples tended to decrease between 1980 and 1989. However, the dispersion started to rise up in the beginning of 1990s and reached to 0.94 in 1999. In 2000s, the σ convergence could be seen easily, because the per capita income inequality between poor EU countries and rich countries decreased from 0.93 to 0.79. In the same way, the coefficient of variation, which was about 0.1 in 1990s, was managed to decrease to 0.082 in 2009. The decreasing dispersion shows the existence of σ convergence among EU countries between 2000 and 2009.

2.2 Literature Review

The term of convergence was stressed in many studies (Baumol, 1986, DeLong, 1988 Easterlin, 1960, Borts & Stein, (1964), Streissler, 1979, Dowrick & Nguyen, 1989, Abramovitz, 1986)

Crespo-Cuaresma et al. (2002) studied with 15 EU member countries and showed up the convergence in EU. They investigated the EU countries between 1960

[3] **Source:** Author's own calculations

and 1998. They used investment rate, the years of education, average inflation rate, government consumption share, openness and length of EU membership as control variables. They obtained high significant results and showed the existence of conditional and unconditional β convergence among EU countries. According to their results, the real GDP per capita dispersion was decreasing between 1960 and 1998. This means there was σ convergence between 15 EU countries. Also, they used threshold panel data technique to show the developing EU countries gain advantages whether more than the developed EU countries. The results of this technique implied that the poor countries benefits from the EU membership more than the rich countries.

Rassekh et al. (2001) studied with OECD countries between the years, 1950 - 1990 and showed the existence of convergence among the OECD countries with the effects of investment, government consumption and exports. Also, they proved that there was a negative relation between convergence and investment, also exports, whereas it was positive between government consumption and convergence. Also, they pointed out that the sample was so important component for convergence and it could be different by region.

Vanhoudt (1999) investigated the effect of EU membership on OECD countries. In contrary to others, he did not find any relationship between long term growth and EU membership or length of membership.

Kutan and Yiğit (2007) reported that the convergence rate of EU member countries would increase. Their results showed that EU membership was enhancing the productivity and productivity growth, also Structural Funds and Cohesion Funds had extremely important role in this growth.

Barro and Sala-i Martin (2004) showed the existence of σ convergence across European regions from 1950 to 1990. Also, they found some evidence of the existence of convergence across countries. According to Barro's results, there was conditional convergence among about 80 countries from 1965 to 1995.

Falk and Sinabell (2008) supported the Barro and Sala-i Martin (2004)'s results and he reported that there was a convergence among EU regions but in slower rate which was 0.5 per year. Also, Reza and Zahra (2008) proved that there was unconditional convergence among 10 EU new members between 1995 and 2005.

Beugelsdijk and Sylvester (2005) showed the positive impact of the Structural Funds in the new members' economies and proved that the developing members tended to catch up to the developed members.

2.3 Unconditional (Absolute) β Economic Convergence

2.3.1 Methodology

In order to show the existence of the convergence we have to divide the data into subgroup. According to Barro and Sala-i Martin (2004), ten year period is suitable for the convergence among economies. Also, their results showed that five year period was not as significant as ten year period and ten year period data gave better solutions for their samples. In this way, we have three ten year periods which are (1980-1989), (1990-1999) and (2000-2009). Our data include 27 EU member countries.

In this thesis, our regression models will be based on Crespo-Cuaresma et al. (2002). So, to analyze the unconditional β convergence we will use their unconditional convergence model;

$$\frac{\left[\ln\left(y'_{t,i}\right) - \ln\left(y_{t,i}\right)\right]}{n_t} = \alpha + \beta \cdot \ln\left(y_{t,i}\right) + u_{t,i} \qquad (2.1)$$

where "$y'_{t,i}$" is the real GDP per capita in the last year of period t (t is 1980-1989, 1990-1999, 2000-2009) for country i, and $y_{t,i}$ is the initial year GDP per capita in period t for country i. Also, n_t is the number of year in period t. $u_{t,i}$ is the error term.

[$\ln(y'_{t,i}) - \ln(y_{t,i})$] / n_t gives the average yearly per capita income gain of country i in period t.

The data of real GDP per capita are obtained from the World Bank. The β coefficient is estimated with panel data regression. β coefficient gives information about the existence of convergence. If the sign of the coefficient is negative, this means that there is a negative correlation between initial level of income and growth rate. Inversely, if the estimated coefficient is positive, the developed countries grow faster than the poor ones. So, when the β coefficient is positive, we can't talk about the β convergence.

In literature the convergence rate is computed as;

$$\lambda = -\frac{[1 - \exp(\beta \, . \, n_t)]}{n_t} \tag{2.2}$$

where β is the coefficient of initial level of real GDP per capita and n_t is the number of year in a period (Crespo-Cuaresma et al., 2002).

2.3.2 Results

Equation (2.1) gives us the unconditional β convergence results presented in Table 2.4. The Fixed Effect panel data regression and Random Effect GLS panel data regressions are compared with "Hausman Test". According to Hausman Test result, we choose the Fixed Effect panel data regression with the value of chi-square that is 5.77 and significant at %5 confidence intervals. The F-stat is 18.15 (p-val for the Null of overall significance is 0.0002) which means the regression selected have the capability of explaining the growth rate of real GDP per capita. The value of overall R^2 is 0.02.

Table 2.4: Unconditional β Convergence in EU (1980-2009)

Fixed Effect (within) regression	**Coefficient**	**Standard Error**
α	0.3113***	(0.0685)
β	-0.0319***	(0.0075)
Observations	76	
R^2	within	0.1273
	between	0.0925
	overall	0.0286

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis. *** (**) [*] means 1% (5%) [10%] significant.

Constant coefficient, which is 0.3113 and standard error is 0.0685, is highly significant and has positive sign. The sign of the coefficient of β is negative and it is highly significant. This shows the existence of the absolute economic convergence among EU countries and the negatively strong relation between initial real GDP per capita and the growth rate as seen in Figure 2.1. In other words, the developing EU countries grow faster than the developed EU countries.

The convergence speed can be calculated with using equation (2.2). The speed of convergence is calculated as %2.7. This means that the developing countries can catch up the developed countries in ten years.

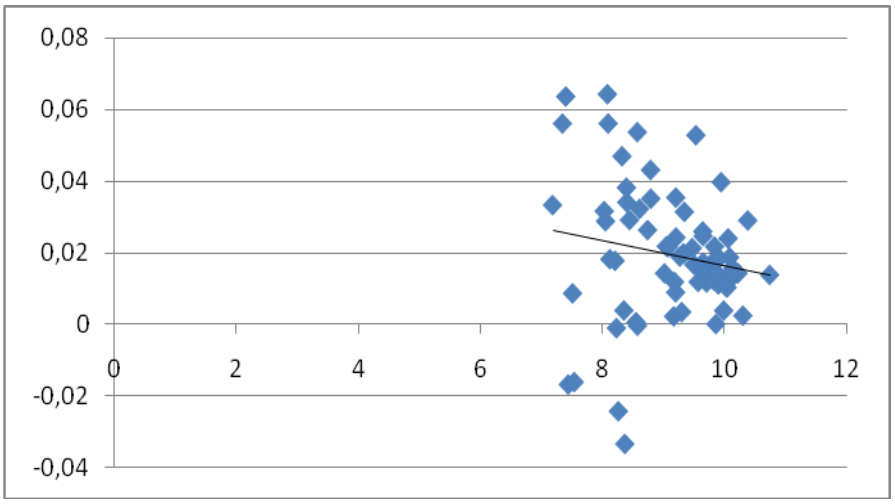

Figure 2.1: GDP per Capita - GDP per Capita Growth Rate (1980-2009)

2.4 Conditional β Economic Convergence

2.4.1 Methodology

The growth rate of real GDP per capita is dependent variable of our model, whereas initial level of personal income and control variables are identified as independent variables. The model which was used by Crespo-Cuaresma et al. (2002) is useful for our samples and we expand it with adding dummy variable for getting information about the affectivity of EU membership.

The model is:

$$\frac{\left[\ln\left(y'_{t,i}\right)-\ln\left(y_{t,i}\right)\right]}{n_t} = \alpha + \beta.\ln\left(y_{t,i}\right) + \beta_2.OPEN_{t,i} + \beta_3.INF_{t,i} + \beta_4.INV_{t,i} +$$

$$\beta_5.GOVEXP_{t,i} + \beta_6.SCH_{t,i} + \beta_7.NOY_{t,i} + \beta_8.DUMMY_{t,i} + u_{t,i} \qquad (2.3)^4$$

[4] This model was used by Crespo-Cuaresma et al. (2002) for analysing the conditional convergence among 15 EU countries between 1960 and 1998.

where $\ln(y'_{t,i})$ is the logarithm of real GDP per capita in last year of period t (t is 1980-1989, 1990-1999, 2000-2009) in country i, $\ln(y_{t,i})$ is the logarithm of initial level of real GDP per capita at t^{th} period in country i. n_t is the length of a period in terms of year. OPEN is the average yearly openness rate in period t in country i. INF is the average yearly inflation rate in period t in country i. INV refers the investment share in GDP in period t for country i. GOVEXP is identified as the government expenditure share in GDP. Both INV and GOVEX include percentage data. SCH implies the school attainment which is the average year of total schooling in period t for country i. NOY means the length of the EU membership of i^{th} country in period t. Also, $u_{t,i}$ is error term. DUMMY refers to dummy variable which gives the value of 1 when country i is a member of EU in period t and gives the value of 0 when country i is not a member of EU in period t. The detailed information about the variables is represented in Table 2.5.

Table 2.5: The Variables and Definitions

Variable		Definition	Source
y	Real GDP per capita	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars.	World Bank
OPEN	Openness	Exports plus Imports divided by Real GDP. This is the constant price equivalent of the Openness variable and is the total trade as a percentage of GDP.	PENN World Table 6.3
INF	Inflation	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	World Bank
INV	Investment Rate	Investment Share of Real GDP per capita	PENN World Table 6.3
GOVEXP	Government Expenditure Rate	Government Expenditure Share of Real GDP per capita	PENN World Table 6.3
SCH	School Attainment	Average Year of Total Schooling	Barro R. & J.W. Lee (v. 2.0,07/10)

2.4.2 Results

The results of model (2.3) are shown in Table 2.6. Fixed Effect panel data regression is used to estimate the coefficients of variables. According to result of Hausman Test, Fixed Effect panel data regression is suitable than Random Effect regression. Chi-squared is equal to 43.94 (p-val is equal to 0.000).

The F-stat value of the regression is 17.49 (p-val for the Null of overall significance is 0.000) which guarantee that the growth rate of real GDP per capita can be explained completely by the selected control variables. However, the value of overall R^2 is not very high (0.1255).

Table 2.6: Conditional β Convergence in EU (1980-2009)

Fixed Effect (within) regression	Coefficients	Standard Error
Constant	0.7202***	(0.1427)
Real GDP per Capita	-0.0819***	(0.0152)
Openness	0.0002**	(0 .0001)
Inflation	-0.0002***	(0.00008)
Investment Rate	0.0001	(0.0005)
Government Expenditure Rate	0.0003	(0.0006)
School Attainment	-0.0002	(0.0031)
Number of Year	0.0007	(0.0006)
Dummy	0.0160***	(0.0049)
Observations	72	
R^2	within	0.8300
	between	0.1339
	overall	0.1255

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis. *** (**) [*] means 1% (5%) [10%] significant.

2.4.2.1 Initial Real GDP per Capita

$\ln(y_{t,i})$ is the real GDP per capita in 1980 for the period 1980-1989, 1990 for 1990-1999 and 2000 for 2000-2009. The coefficient has negative sign again. This means that there is conditional economic convergence among EU countries. Also, the convergence speed is almost %5.5. The coefficient is significant at %1 confidence intervals and p-val is equal to 0.000. The growth rate is affected by the initial level of income negatively that the poor EU countries grow faster than rich EU countries conditionally. The findings of Crespo-Cuaresma et al. (2002) support this result. He investigated the convergence across 15 EU countries from 1960 to 1998 and found highly significant results. He showed the existence of the convergence across 15 EU countries and calculated the convergence speed about 4.5%. The developing countries can reach the economic level of the developed countries in ten years.

2.4.2.2 Openness

Openness is defined as average ratio of exports plus imports to real GDP in ten year period. Regression results indicate that the positively relationship between openness and economic growth rate. The value of the coefficient is 0.0002, standard error is 0.0001 and it is significant at %5 confidence intervals. The estimated coefficient means that a one standard deviation increase in openness rate raises the growth rate of life expectancy on impact by 0.0002. Crespo-Cuaresma et al. (2002), Harrison (1996), Sachs and Warner, (1995) and Barro and Sala-i Martin (2004) found the parallel results.

2.4.2.3 Inflation

The coefficient of the inflation is negative and highly significant. The coefficient of inflation (-0.0002), which is significant at 1% confidence intervals. There is a negative correlation between growth rate of the per capita income and inflation, also an increase in inflation rate reduces the growth rate of economies by 0.0002. Parallel to our results, Crespo-Cuaresma et al. (2002) and Barro and Sala-i Martin (2004) found the negative and highly significant results.

2.4.2.4 Investment Rate

Coefficient of investment rate, 0.0001 and standard error is (0.0005), investment rate is not significant. However, its sign is positive (Barro, 1991, Levine and Renelt, 1992 and Crespo-Cuaresma, et al. 2002). The growth rate of real GDP per capita goes up in connection with increasing investment share in GDP.

2.4.2.5 Government Expenditure Rate

According to Table 2.6, the coefficient of government expenditure share is 0.0003 and standard error is 0.0006. The positive sign is unexpected and regression results show that there is a positive and insignificant correlation between government expenditure share and growth rate in contrary to Barro and Sala-i Martin (2004),

Crespo-Cuaresma et al. (2002), Barro (1991) and Barro (1997). They showed the negative relation between growth of per capita income and government expenditure.

2.4.2.6 School Attainment

The estimated coefficient, -0.0002 (0.0031), is insignificant. The regression result of school attainment refers the negative correlation between growth rate of real GDP per capita and average years of schooling. However, Barro (1991) and Levine and Renelt (1992) found the positive correlation between years of schooling and economic growth. Also, the model of Crespo-Cuaresma et al. (2002) includes this variable and his results indicate the positive relationship between years of education and economic growth.

2.4.2.7 Number of Year

The data of NOY are established with identifying the length of the EU membership in each period. The studies about the convergence showed that there is a positive relationship between length of the EU membership and growth rate of real GDP per capita (Crespo-Cuaresma, et al. 2002). The estimated coefficient, 0.0007 (0.0006), is insignificant.

2.4.2.8 Dummy

The findings refer the positive and highly significant relationship between EU membership and the economic growth rate. The estimated coefficient, 0.016 (0.0049), means that the EU membership influences the real GDP per capita growth rate almost 2% positively.

2.5 σ Economic Convergence in EU

σ convergence refers the decreasing cross sectional standard deviation of the logarithm of the real per capita income for 27 EU member countries. We use the coefficient of variation which is the alternative way of the σ convergence. Coefficient of variation is dividing the standard deviation by the mean of the sample. Figure 2.2 shows the dispersion of the logarithm of real GDP per capita among EU

countries between 1980 and 2009. According to this chart, dispersion of per capita income was decreasing from 1980 to 1988. However, the 1989-1994 period was not going well for the EU countries. The dispersion of personal income was going up sharply in this period and reached to 0.103 in 1994. In 1992-1999 period, there was a stable dispersion among EU countries and the dispersion of coefficient of variation was around 0.1 in this period. After 2000, the dispersion was starting to decrease and σ convergence was provided. It has been seen easily that the poor countries have tended to catch up the rich countries since in the beginning of 2000s.

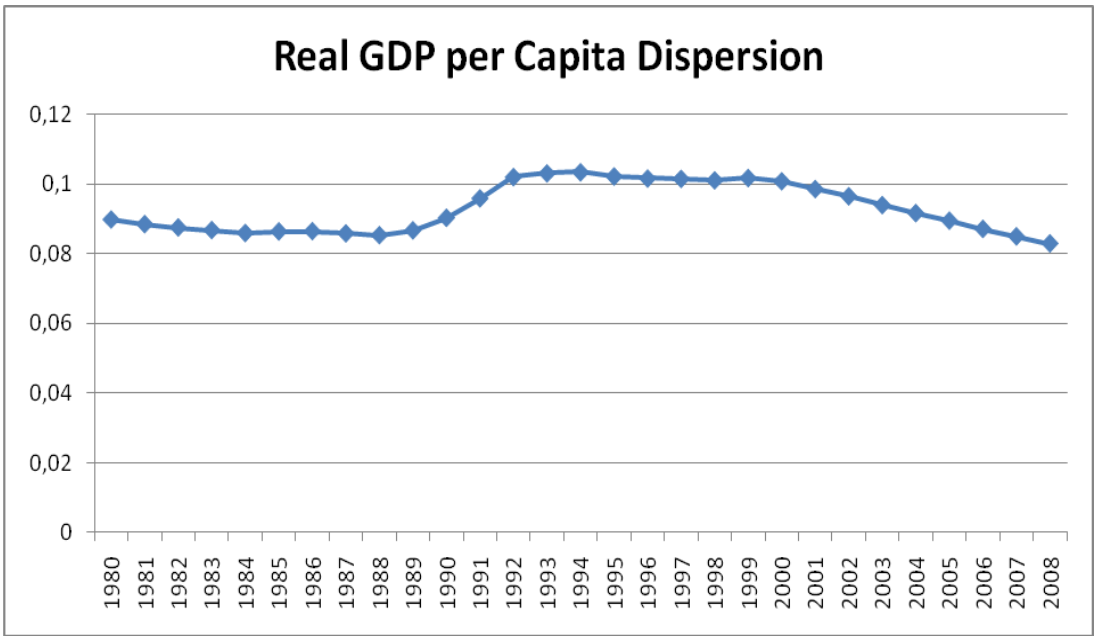

Figure 2.2: Dispersion of per Capita Income across EU Countries (1980-2009)

Spite of the increasing income inequality in 1990s, EU was managed to reverse this retrogressive trend in the beginning of 21th century. Also, the coefficient of variation, which was 0.089 in 1980, decreased to 0.082 in 2009. The existence of σ convergence is the sign of the decreasing income inequality among EU countries.

2.6 Concluding Remark

Many studies showed that the membership of an economic organization affects the economies positively. So, the effect of EU membership on member's economies is tested with using the concepts of β convergence, σ convergence and dummy variable. As a result, the developing EU countries tend to converge to the developed EU countries. Besides, some variables influence the economic growth of EU countries significantly. Openness and investment are playing a role as an economic growth enhancer in economies, whereas inflation rate influences the economies negatively. Also, dummy variable shows that if a country is a member of EU, its economy grows more than 2%.

In consequence, the findings show that EU membership is effective in the way of economic growth and income per capita. The new member countries tend to catch up the developed countries thanks to economic effects of EU membership.

CHAPTER 3

LIFE EXPECTANCY CONVERGENCE

3.1 The Life Expectancy Convergence in EU

The one of the main missions of the governments is not only increasing the per capita income level of societies, but also providing healthier societies, longevity and having higher level of social welfare. In one sense, the health levels of the societies are the insurance of their futures and the health has an indispensible role in people's well-being (Nordaus, 2002). In next chapter, the welfare will be defined as a combination of the life expectancy and the per capita income. In this way, when it is thought the healthier societies live longer, health has a role as welfare enhancing in societies.

Table 3.1: The Life Expectancy Statistics (1980-2009)[5]

	1980 - 1989		1990 - 1999		2000 - 2009	
Minimum	68.808	69.461	69.273	69.742	70.365	71.821
Maximum	75.743	77.726	77.536	79.430	79.648	81.945
Mean	72.289	73.698	73.945	75.587	75.976	78.125

Table 3.1 shows the value of life expectancy among EU countries between 1980 and 2009. According to these statistics, the minimum level of the life expectancy, Latvia had 68 in 1980 and Lithuania had 71 in 2009, increased in thirty years. Besides, the maximum level of the life expectancy increased from 75(Netherlands) to 81(Italy) and the average life expectancy increased from 72 to 78 in last three decades.

[5] **Source:** Author's own calculations

Table 3.2: The Logarithm of Life Expectancy Statistics (1980-2009)[6]

	1980 - 1989		1990 - 1999		2000 - 2009	
Minimum	4.231	4.240	4.238	4.244	4.253	4.274
Maximum	4.327	4.3531	4.350	4.374	4.377	4.406
Mean	4.280	4.299	4.302	4.324	4.329	4.357
Standard Deviation	0.0300	0.0374	0.0377	0.0414	0.0402	0.0412
Coefficient of Variation	0.0070	0.0087	0.0087	0.0095	0.0093	0.0094

Table 3.2 represents the statistics of the logarithm of the life expectancy between 1980 and 2009. According to these results, the standard deviation of the logarithm of life expectancy increased continuously between 1980 and 1999. Also, the dispersion of life expectancy reached the top level in 1990-1999 period. The coefficient of variation increased from 0.007 in 1980 to 0.0095 in 1999 and it showed a stable trend around 0.094 between 2000 and 2009.

These results show that there was an increase of the life expectancy among EU members between 1980 and 2009, but there was no decrease in the distribution of the logarithm of life expectancy. This can be interpreted that the countries which have lower longevity did not increase their life expectancy as much as the ones which have higher longevity. So the dispersion of the life expectancy stayed stable or increased between 1980 and 2009. According to results, the lagging countries which means having lower level of life expectancy have some difficulties to catch up the life expectancy level of leading countries in European Union.

3.2 Literature Review

Longevity was mentioned in many studies. Some of them investigated the relationship between economic activities and the health expenditure convergence. For example, Aghion et al. (2010) investigated the relation between economic growth and life expectancy and found the positive correlation between economic growth and the longevity. Barro and Sala-i Martin (2004) proved that higher level of

[6] **Source:** Author's own calculations

life expectancy was acting as enhancer of economic growth. Also, there are many studies which support these results (Bloom et al,.2001, Sala-i Martin, X., Doppelhofer G., & Miller R. 2004).

Nixon (1999) proved the existence of the health expenditure-convergence among EU countries and the health expenditure of lagging countries converged to the mean of the health expenditures of EU countries.

Kerem et al. (2008) found the convergence speed of health care expenditures of EU countries as 7%. Besides, they showed that there was σ convergence between 1992 and 2004 among EU countries.

3.3 Unconditional β Life Expectancy Convergence in EU

3.3.1Methodology

As mentioned at the beginning, the effects of the control variables are equal in the steady state level of the countries in unconditional β convergence, so our model is based on the growth rate of the average life expectancy and initial level of the life expectancy of EU countries. The life expectancy data which refer the average level of life expectancy of a newborn in a country is obtained from World Bank. We will apply the model of Crespo-Cuaresma et al. (2002) to life expectancy as follows:

$$\frac{[\ln(L'_{t,i}) - \ln(L_{t,i})]}{n_t} = \alpha + \beta . \ln(L_{t,i}) + u_{t,i} \qquad (3.1)$$

where $\ln(L'_{t,i})$ is the logarithm of the last year average life expectancy and $\ln(L_{t,i})$ is the initial level of life expectancy of country i in t^{th} period. Also, n_t is the length of the period and $u_{t,i}$ is the error term.

$[\ln(L'_{t,i}) - \ln(L_{t,i})] / n_t$ gives the average yearly life expectancy gain of country i in period t. The estimated coefficient β gives the evidence about the unconditional life expectancy convergence among EU countries. When the β is negative, this

means that the countries having higher life expectancy level grow slower than the ones having lower life expectancy level.

3.3.2 Results

The Random Effects GLS panel data regression results of the model (3.1) are shown in Table (3.3).

Table 3.3: Unconditional β Life Expectancy-Convergence in EU (1980-2009)

Random Effects GLS Regression	Coefficient	Standard Error
α	-0.0310**	(0.0110)
β	0. 0078**	(0.0025)
Observations	81	
R^2	within	0.0839
	between	0.0844
	overall	0.0732

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis. *** (**) [*] means 1% (5%) [10%] significant.

We compared Fixed Effect panel data regression and Random Effect GLS panel data regression with using Hausman Test. According to Hausman Test results, Fixed Effect regression is not suitable for the unconditional β life expectancy-convergence. Because the value of chi-square is 0.93 and the p-val is 0.33. On the other hand, the Random Effects GLS panel data regression is overall significant (F-stat is 6.23 and p-val is 0.01), whereas Fixed Effects panel data regression is not overall significant (F-stat is 1.16 and p-val is 0.31). So, we use Random Effect GLS panel data regression for this model.

Although the R^2 (7%) is not very high; the estimated coefficient is significant and positive. As shown in Figure 3.1, there is a positive relationship between life expectancy growth and initial level of life expectancy. So, there is not unconditional β life expectancy-convergence among EU members. This means that the leading

countries which have higher life expectancy grow faster than the lagging EU countries which have lower life expectancy at least 0.5%.

The developed countries are generally institutionalized and institutionalization has a crucial impact on longevity and health status of countries (Baum et al., 2003). The institutionalization process can take long time in the developing countries. In this way, the developing countries have difficulties to catch up the developed countries.

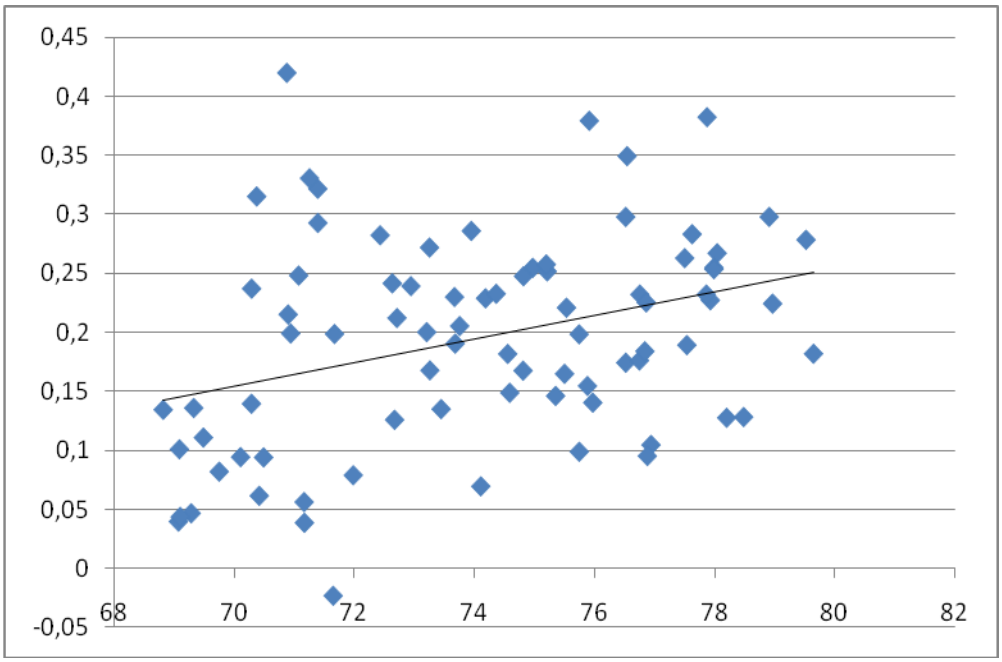

Figure 3.1: Life Expectancy – Life Expectancy Growth Rate (1980-2009)

3.4 Conditional β Life Expectancy Convergence in EU

3.4.1Methodology

Crespo-Cuaresma et al. (2002)'s unconditional convergence model will be applied for testing the conditional life expectancy-convergence among EU countries with using the panel data regression.

The model is:

$$\frac{[\ln(L'_{t,i}) - \ln(L_{t,i})]}{n_t} = \alpha + \beta . \ln(L_{t,i}) + + \beta_2 . OPEN_{t,i} + \beta_3 . INF_{t,i} + \beta_4 . INV_{t,i}$$

$$+ \beta_5 . GOVEXP_{t,i} + \beta_6 . SCH_{t,i} + \beta_7 . NOY_{t,i} + \beta_8 . DUMMY_{t,i} + u_{t,i} \quad (3.2)$$

where $\ln(L'_{t,i})$ is the logarithm of life expectancy in last year of period t (t=1980-1989, 1990-1999, 2000-2009) in country i and $\ln(L_{t,i})$ is the logarithm of initial level of life expectancy at period t in country i. The variables can be defined as follows:

OPEN is the average yearly openness rate in t^{th} period for country i,

INF is the average yearly inflation rate in t^{th} period for country i,

INV refers the investment share in GDP in t^{th} period for country i,

GOVEXP is identified as the government expenditure share in GDP in t^{th} period for country i,

SCH implies the school attainment which is the average year of total schooling in t^{th} period for country i,

NOY means the length of the EU membership in t^{th} period for country i,

DUMMY is dummy variable gives 1 if a country is a member, otherwise 0,

$u_{t,i}$ is error term,

n_t is the length of the period in terms of year.

3.4.2 Results

The results of model (3.2) are shown in Table (3.4). The Hausman Test results, chi-square is equal to 15.17 and p-val is equal to 0.0339, refer that the Fixed Effect panel data regression is so suitable than Random Effect GLS panel data regression. Though overall R^2 is 0.1037, F-stat is 13.63 with p-val 0.00 assures the overall significance.

Table 3.4: Conditional β Life Expectancy Convergence in EU (1980 – 2009)

Fixed Effect (within) regression	Coefficients	Standard Error
Constant	0.1930***	(0.5452)
Life Expectancy	-0.0462***	(0.0127)
Openness	0.00002***	(6.99e-06)
Inflation	2.28e-06	(4.97e-06)
Investment Rate	0.00008**	(0.00004)
Government Expenditure Rate	0.00004	(0.00004)
School Attainment	0.0001	(0.0002)
Number of Year	0.00008**	(0.00004)
Dummy	0.0008**	(0.0004)
Observations	73	
R^2	within	0.6603
	between	0.0335
	overall	0.1037

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis.. ***(**)[*] means 1% (5%) [10%] significant.

The health expenditures can be increased when the per capita income goes up, so the increased life expectancy can be expected in developed countries in EU. As mentioned before, the coefficients of openness, investment rate, length of EU membership and union affiliation increase the per capita income growth whereas inflation decreases it. The longevity of a society is related with income, technology and many other variables but the income level is extremely important for longevity. Rosen (1988) reported that the individual can be willing to consume much for gaining longevity when his income increases. So, it is expected that these variables can affect the life expectancies of the countries analogously. In addition, we used dummy variable for testing the effectiveness of EU in previous section and showed that the membership increased the economic growth by 2%. In the same way, the life

expectancy of EU countries can be increased because of positive effect of membership.

3.4.2.1 Life Expectancy

The estimated coefficient of the logarithm of life expectancy, -0.0462 (0.0127), means that one standard deviation increase in the logarithm of life expectancy reduces the growth rate on impact by 0.06. That shows the existence of the convergence that the developing countries' life expectancy level grows faster than the developed ones. Also, the coefficient is significant at %1 confidence intervals and the convergence rate is 0.058.

3.4.2.2 Openness

The estimated coefficient, 0.00002 (6.99e-06), shows the positive relationship between openness and life expectancy growth rate and it is highly significant. Despite a little positive effect on life expectancy growth, openness acts as life expectancy enhancer.

3.4.2.3 Inflation

The regression results show the positive correlation between life expectancy growth and estimated coefficient of inflation, 2.28e-06 (4.97e-06). Inflation's coefficient is insignificant and the sign of the estimated coefficient is not expected.

3.4.2.4 Investment Rate

The coefficient of the investment rate, 0.00008 (0.00004), is significant at 5% confidence intervals. The sign of the coefficient is positive like openness that they enhance the longevity.

3.4.2.5 Government Expenditure Rate

The estimated coefficient, 0.00004 (0.00004), indicates the positive relation between life expectancy growth rate and government expenditures. The estimated coefficient is positive and insignificant.

3.4.2.6 School Attainment

The regression results refer a positively relation between school attainment and growth rate of life expectancy with estimated coefficient, 0.0001 (0.0002). The coefficient is positive, but it is not significant.

3.4.2.7 Number of Year

The estimated coefficient,0.00008 (0.00004), means that a one standard deviation increase in length of EU membership raises the growth rate of life expectancy on impact by 0.000085. The result is positive and significant at 5% confidence intervals.

3.4.2.8 Dummy

Dummy variable is useful for showing the impact of EU membership. The estimated coefficient, 0.0008 (0.0004), means that the membership raises the life expectancy growth at least 0.0008. The coefficient is positive and significant at 5% confidence intervals.

3.5 σ Life Expectancy Convergence in EU

The dispersion of the coefficient of variation, which is dividing the standard deviation by mean of the sample, is represented in Figure 3.2. The dispersion of the logarithm of life expectancy was remittent between 1980 and 1988. It was increasing from 0.007 in 1980 to 0.0077 in 1987. After 1988, the dispersion of life expectancy started to rise until 1995. The coefficient of variation was increased from 0.0085 in 1988 to 0.0113 in 1995. The distribution of the coefficient of the variation started to go down between 1995 and 2003. After 2004, the trend went up slightly, whereas it decreased after 2007. In the end, the coefficient of variation of life expectancy reached 0.0096 in 2009. According to Figure 3.2, the life expectancy deviation increased until 1995. We can say that the life expectancy inequality between leading and lagging countries was rising in this period. However, after especially 1997, the membership activities started to increase, so the dispersion started to decrease.

As shown in Figure 3.2, the life expectancy differences between EU countries increased in 1990s, similarly the dispersion of per capita income. Especially, the life expectancy inequality increased to its top level in 1994. In spite of the fact that the distribution of the logarithm of life expectancy started to decrease after 1994, it is hardly to say that according to Figure 3.2, EU succeed to reduce the inequality of longevity between countries.

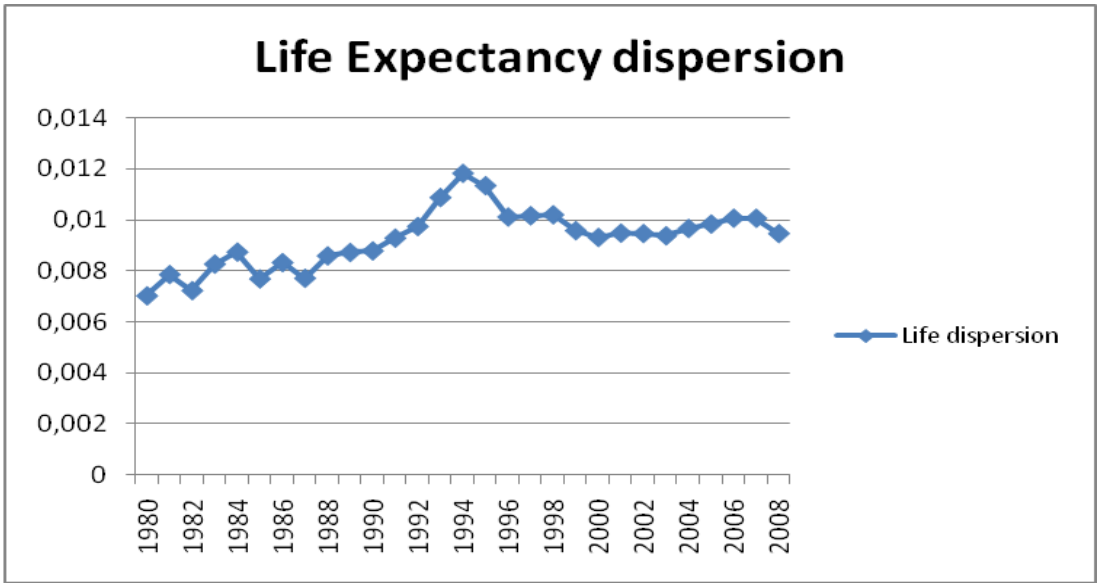

Figure 3.2: The Dispersion of the Life Expectancy (1980 - 2009)

3.6 Concluding Remark

According to results, there is not unconditional β life expectancy-convergence among EU countries from 1980 to 2009. In other words, the long-lived countries increase their life span faster short-lived countries unconditionally. Contrary to this result, there is conditional β life expectancy-convergence among EU members in last three decades. The more realistic results can be obtained by conditional convergence theory, because each economy converges its own steady state level with the impact of control variables. So, it can be said that the short-lived countries' life expectancies grow faster than the long-lived EU countries with the effects of some indicators such as, openness, inflation, investment, government

expenditure, education and length membership. Also, our model includes dummy variable which gives 1, if a country is a member in a specific period, otherwise gives 0. It shows the impact of membership on life expectancy growth of countries. According to results, if a country is a member of EU, it will increase its life expectancy by 0.1%.

As a result, the new members start to increase their per capita income and life expectancy with the benefits from the opportunities provided by EU. Also, despite a small amount life span changing, EU is acting like a life expectancy enhancer. So, the EU membership is positively effective on member countries.

CHAPTER 4

WELFARE CONVERGENCE

4.1 The Monetary Value of Lifetime

As seen in the previous chapters, EU membership influences the new members' income and longevity positively. In one sense, this can be an opportunity provided by EU to reach high quality living standard. In this way, a question can be asked in this point: "Is the quality of life in member countries increasing due to enhancing life expectancy and income?" Becker et al. (2005) answered this question that the welfare of societies is affected by not only income but also length of life expectancy.

A concept is needed to measure the value of life expectancy which is called "full income". The concept of full income is a combination of income per capita and life expectancy and gives the monetary value of gaining life expectancy in a period. In the previous chapters, increase in income and lifetime is shown, so an increase in the value of lifetime can be expected. Also, we will define a welfare function which includes the income change and value of gaining life in a period, so increase in these variables will enhance the welfare of the society.

4.2 The Full Income

The methodology of full income was coined by Usher (1973) and developed by Rosen (1988). After that, Becker et al. (2005) and Soares (2007) developed and simplified this methodology. We will use Becker et al. (2005) and Soares (2007)'s method to obtain the monetary value of lifetime. This methodology can be defined as follows. The indirect utility function V(Y, S) where Y is the lifetime income and S is the survival function.

$$V(Y, S) = \max \int_0^{\infty} \exp(-\rho t) . S(t) . u\big(c(t)\big) . dt \quad (4.1)$$

subject to

$$Y = \int_0^{\infty} \exp(-rt) . S(t) . y(t) . dt = \int_0^{\infty} \exp(-rt) . S(t) . c(t) . dt \quad (4.2)$$

Survival function shows the survival probability of an individual in a period. In this thesis, we will assume that each individual's lifetime is the average life expectancy of the country in a specific period, so if an individual is alive, survival function will be equal to 1, inversely, if he is dead, it will be 0. We can simplify this equation by the help of this assumption:

$$V(Y,L) = \max \int_0^{L} \exp(-\rho t) . u\big(c(t)\big) . dt \quad (4.3)$$

subject to

$$Y = \int_0^{L} \exp(-rt) . y(t) . dt = \int_0^{L} \exp(-rt) . c(t) . dt \quad (4.4)$$

where L refers the lifetime, y(t) is the per capita income and c(t) is the consumption at age t, r is interest rate and ρ is subjective discount rate and u(.) is the utility function.

As mentioned by Rosen (1988), the value of lifetime can be measure with willingness to pay for increasing longevity. So we can define income equivalent compensation that an additional income which provides reaching to the next period's utility with initial life expectancy level.

In other words, Y refers the initial level total lifetime income and L is the life expectancy at first period whereas Y' implies the total income and L' is the life

expectancy in second period. These periods are any two time of an individual's life. We can define the income equivalent compensation as follows;

$$V(Y' + F, L) = V(Y', L') \tag{4.5}$$

In one sense, F shows the willingness of the individual for reaching to next period's level of life expectancy. So, F can be defined as the total value of the gaining life expectancy (L' – L) in terms of income throughout the life of the individual.

The methodology can be simplified with some assumptions as offered by Becker et al. (2005) and Soares (2007) such as, ρ = r and c(t) = c = y(t) = y. Consumption (c) and income (y) at age t are constants. Becker et al. (2005) and Soares (2007) defined the hypothetical life-cycle individual as a representative individual who is earning the average per capita income of the country and his total longevity is equal to the average level of the country's life expectancy. With the help of this definition, the indirect utility function can be defined in terms of yearly income.

$$V(y,S) = u(y).\int_0^{\infty} \exp(-rt).S(t).dt = u(y).A(S) \tag{4.6}$$

Becker et al. (2005) defined the equation of $A(S) = \int_0^{\infty} \exp(-rt).S(t).dt$ as an annuity depended on the survival function. According to our assumptions, the hypothetical individual lives as much as the average life expectancy of country in a specific period. The probability of this individual's living is 100% until the age of the average life expectancy of country. So, the survival function gives the value of 1 until the average level of life expectancy of the country, after that age it gives the value of 0. Thus, the indirect utility function can be simplified,

$$V(y,L) = u(y).\int_0^{L} \exp(-rt).dt = u(y).A(L) \tag{4.7}$$

As defined by Soares (2007) the value of annuity can be written as,

$$A(L) = \frac{(1-\exp(-rL))}{r} \tag{4.8}$$

Income equivalent compensation F shows the total value of gaining longevity in terms of per capita total lifetime income. Also Becker et al. (2005) and Soares (2007) defined the yearly income equivalent compensation which is called full income and showed with "f" to measure the value of gaining life expectancy in terms of yearly per capita income. Full income can be represented as

$$u(y' + f).A(L) = u(y').A(L') \tag{4.9}$$

Accordingly, the monetary value of the total gain in welfare of society, which can be defined with per capita income and monetary value of life, can be written as

$$f + (y' - y) \tag{4.10}$$

$$\frac{f}{f+(y'-y)} \tag{4.11}$$

shows the fraction of life expectancy in the gaining welfare and

$$\frac{y'-y}{f+(y'-y)} \tag{4.12}$$

implies the fraction of income in the gaining welfare.

According to this methodology, welfare depends on income and length of living. So, an increase in these indicators will enhance the welfare.

Rosen (1988) defined the utility function depended on income and intertemporal substitution:

$$u(c) = \frac{c^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \alpha \tag{4.13}$$

As defined by Becker et al. (2005) and Soares (2007), α is the minimum consumption level of an individual and γ is intertemporal elasticity of substitution. Also,

$$\varepsilon = \frac{u'(c)}{u(c)} = \frac{c^{1-\frac{1}{\gamma}}}{\frac{c^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \alpha} \tag{4.14}$$

$$\alpha = c^{1-1/\gamma} \cdot \left(\frac{1}{\varepsilon} - \frac{1}{1-\frac{1}{\gamma}} \right) \tag{4.15}$$

In this way, we adhere to values of ε and γ used by Becker et al. (2005). ε is equal to 0.346 and γ =1.25. We calculates α values with using these values and midyear real GDP per capita – midyear is 1995 for thirty year period - for each EU country.

We can obtain the equation of full income with inverting the equation (4.9) (Soares, 2007);

$$f = u^{-1}\left[\frac{u(y').A(L')}{A(L)}\right] - y' \tag{4.16}$$

We obtain the extended equation of full income with inverting utility function (Becker et al., 2005);

$$f = \left[y'^{\left(1-\frac{1}{\gamma}\right)} . \frac{A(L')}{A(L)} + \alpha . \left(1 - \frac{1}{\gamma}\right) . \left(\frac{A(L') - A(L)}{A(L)}\right) \right]^{\frac{\gamma}{\gamma - 1}} - y' \qquad (4.17)$$

This expression shows full income which is the monetary value of the gaining life expectancy in terms of per capita income. The growth rate of welfare will be calculated as

$$g = \frac{y' + f}{y} \qquad (4.18)$$

and the value of total lifetime – income equivalent compensation – can be explained by the following function (Becker et al., 2005);

$$F = f . \int_0^L \exp(-rt)\, dt = e . A(L) \qquad (4.19)$$

Table 4.1 represents the value of full income and the monetary value of overall gain in welfare's growth rate in ten year periods. As seen in table, although the former member countries (before fifth enlargement) have generally higher full income and welfare growth rates are lower, whereas the new members have lower full income and higher welfare growth rate. This means that the lower welfare countries have higher welfare growth rate than the higher welfare countries and this is an indication of the welfare convergence among EU countries. The full income-rich countries are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain and United Kingdom, whereas the full income-poor countries are Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia.

Table 4.1: Full Income Gain in EU (1980 - 2009)[7]

Member states of the EU		1980-1989	1990-1999	2000-2009
Austria (1995)	**f**	563.690	506.804	645.494
	g	0.212	0.219	0.121
Belgium (1957)	**f**	516.900	303.396	637.892
	g	0.205	0.178	0.097
Bulgaria (2007)	**f**	12.444	-3.789	60.473
	g	0.405	-0.156	0.665
Cyprus (2004)	**f**	183.629	217.338	190.504
	g	0.567	0.229	0.197
Czech Republic (2004)	**f**		192.362	206.983
	g		0.033	0.434
Denmark (1973)	**f**	170.595	498.695	684.828
	g	0.215	0.227	0.048
Estonia (2004)	**f**	53.586	52.739	348.957
	g	0.216	0.005	0.683
Finland (1995)	**f**	291.755	570.517	765.076
	g	0.315	0.147	0.304
France (1957)	**f**	427.579	357.709	602.359
	g	0.204	0.149	0.068
Germany (1957)	**f**	476.477	562.700	546.420
	g	0.220	0.183	0.142
Greece (1981)	**f**	233.683	111.221	384.089
	g	0.048	0.138	0.403
Hungary (2004)	**f**	22.491	75.731	248.923
	g	0.201	0.058	0.391
Ireland (1973)	**f**	168.551	374.615	1044.781
	g	0.292	0.722	0.211
Italy (1957)	**f**	470.354	395.863	463.991
	g	0.274	0.149	0.026
Latvia (2004)	**f**	76.296	18.437	236.574
	g	0.358	-0.209	0.823
Lithuania (2004)	**f**		14.443	61.709
	g		-0.279	0.919
Luxembourg (1957)	**f**	696.797	1130.645	1910.496
	g	0.521	0.372	0.190
Malta (2004)	**f**	154.500	156.658	136.679
	g	0.441	0.444	0.146
Netherlands (1957)	**f**	175.000	216.624	661.085
	g	0.163	0.255	0.176
Poland (2004)	**f**		108.388	152.334
	g		0.407	0.499
Portugal (1986)	**f**	264.369	261.139	329.406
	g	0.344	0.275	0.066
Romania (2007)	**f**	11.229	15.905	95.181
	g	0.097	-0.139	0.946
Slovak Republic (2004)	**f**		123.028	213.052
	g		0.031	0.750
Slovenia (2004)	**f**		175.855	554.580
	g		0.175	0.481
Spain (1986)	**f**	157.071	244.859	331.922
	g	0.259	0.242	0.150
Sweden (1995)	**f**	454.453	470.084	520.379
	g	0.227	0.148	0.173
United Kingdom (1973)	**f**	394.858	372.110	634.465
	g	0.305	0.224	0.180

[7] **Source:** Author's own calculations

Table 4.2: Statistics of Full Income (1980 - 2009)[8]

	1980-1989	1990-1999	2000-2009
Minimum	11.22885	-3.78924	60.47325
Maximum	696.7975	1130.645	1910.496
Mean	271.6504	278.6695	469.2086
Standard Deviation	198.808	245.6668	380.2178
Coef. of Variation	0.731852	0.88157	0.810339

Table 4.2 represents the summary statistic of full income between 1980 and 2009. The alteration of the value of full income is more important rather than the value of full income to analyse the welfare levels. The value of minimum full income increased from 11.22 in 1980-1989 period to 60.4 in 2000-2009 period and maximum full income reached to 1910.496 in last decade. The average full income of 27 EU countries developed by183% in last 3 decades and reached to 469.2. According to these statistics, it is shown that the quality of living in EU decreased in 1990-1999 period. Another point is the dispersion of full income, it increased in thirty year. The inequality between EU countries went up especially in 1990-1999 period. The standard deviation increased from 198 to 380 continuously. Also, the coefficient of variation was enhanced to 0.88 in 1990-1999 period, and then it deceased to 0.81 in 2000s.

The gaining income, full income and welfare of EU countries in ten year periods (1980-1989, 1990-1999, 2000-2009) are represented in Table 4.3. As is seen, the high income countries have higher level full income. Especially, the EU members which joined after forth enlargement increased their full income between 2000 and 2009. Despite increasing full income, the gaining welfare is decreasing in developed EU countries. Inversely, the per capita income, life expectancy and welfare tend to increase in developing countries since they joined to union. So, this is an evidence for existence of income, life expectancy and welfare convergence among EU countries.

[8] **Source:** Author's own calculations

Table 4.4 shows the fractions of life expectancy and income in gaining welfare. The majority of gaining welfare is created by the per capita income, especially in the new members. However, the life expectancy fraction in welfare tends to increase and it causes to increase in welfare. Life expectancy fraction in welfare has started to increase in 2000s in EU that the quality of life and health conditions in EU are increasing day by day.

Table 4.3: Gaining Income, Life Expectancy and Welfare (1980-2009)[9]

	PER CAPİTA INCOME			FULL INCOME			WELFARE		
EU MEMBERS	**1980-1989**	**1990-1999**	**2000-2009**	**1980-1989**	**1990-1999**	**2000-2009**	**1980-1989**	**1990-1999**	**2000-2009**
Austria	2815.65	3728.25	2240.64	563.69	506.80	645.49	3379.34	4235.05	2886.13
Belgium	2673.80	3204.00	1510.40	516.90	303.40	637.89	3190.70	3507.40	2148.29
Bulgaria	511.62	-183.66	941.53	12.44	-3.79	60.47	524.06	-187.45	1002.01
Cyprus	3558.44	2232.61	2085.31	183.63	217.34	190.50	3742.07	2449.95	2275.82
Czech Republic		-14.30	1704.17		192.36	206.98		178.06	1911.15
Denmark	4061.82	4967.64	554.94	170.60	498.70	684.83	4232.42	5466.34	1239.77
Estonia	686.87	-56.43	1968.88	53.59	52.74	348.96	740.45	-3.69	2317.83
Finland	4539.63	2452.28	2981.43	291.76	570.52	765.08	4831.38	3022.80	3746.51
France	2752.66	2434.64	906.00	427.58	357.71	602.36	3180.24	2792.35	1508.36
Germany	2961.10	3001.27	1295.31	476.48	562.70	546.42	3437.58	3563.97	1841.73
Greece	225.25	1239.48	3343.03	233.68	111.22	384.09	458.93	1350.70	3727.12
Hungary	715.22	163.15	1143.85	22.49	75.73	248.92	737.71	238.88	1392.77
Ireland	2758.73	9620.84	3122.19	168.55	374.61	1044.78	2927.28	9995.46	4166.97
Italy	3114.34	2061.02	-789.84	470.35	395.86	463.99	3584.69	2456.89	-325.85
Latvia	1056.14	-835.70	1670.51	76.30	18.44	236.57	1132.44	-817.26	1907.09
Lithuania		-1154.31	1886.42		14.44	61.71		-1139.87	1948.13
Luxembourg	10221.07	10943.70	5930.22	696.80	1130.65	1910.50	10917.87	12074.34	7840.71
Malta	1822.04	2795.14	649.73	154.50	156.66	136.68	1976.54	2951.80	786.40
Netherlands	2241.78	4582.99	1914.12	175.00	216.62	661.09	2416.78	4799.61	2575.21
Poland		1153.15	1876.48		108.39	152.33		1261.54	2028.82
Portugal	1963.83	2228.39	145.00	264.37	261.14	329.41	2228.20	2489.53	474.41
Romania	168.45	-279.60	955.66	11.23	15.91	95.18	179.68	-263.70	1050.85
Slovak Republic	531.70	37.27	2715.55		123.03	213.05		160.30	2928.60
Slovenia		1278.31	2577.87		175.85	554.58		1454.17	3132.45
Spain	2125.63	2498.35	1111.81	157.07	244.86	331.92	2282.71	2743.21	1443.74
Sweden	3999.02	3237.49	3020.13	454.45	470.08	520.38	4453.48	3707.58	3540.51
United Kingdom	4374.77	4136.61	2169.75	394.86	372.11	634.47	4769.62	4508.72	2804.22

[9] **Source:** Author's own calculations

Table 4.4: Income and Life Expectancy Fractions in Welfare Gain (1980-2009)[10]

	WELFARE			INCOME FRACTION			LIFE EXPECTANCY FRACTION		
EU MEMBERS	**1980-1989**	**1990-1999**	**2000-2009**	**1980-1989**	**1990-1999**	**2000-2009**	**1980-1989**	**1990-1999**	**2000-2009**
Austria	3379.34	4235.05	2886.13	0.83	0.88	0.78	0.17	0.12	0.22
Belgium	3190.70	3507.40	2148.29	0.84	0.91	0.70	0.16	0.09	0.30
Bulgaria	524.06	-187.45	1002.01	0.98	0.98	0.94	0.02	0.02	0.06
Cyprus	3742.07	2449.95	2275.82	0.95	0.91	0.92	0.05	0.09	0.08
Czech Republic		178.06	1911.15		-0.08	0.89		1.08	0.11
Denmark	4232.42	5466.34	1239.77	0.96	0.91	0.45	0.04	0.09	0.55
Estonia	740.45	-3.69	2317.83	0.93	0.99	0.85	0.07	0.01	0.15
Finland	4831.38	3022.80	3746.51	0.94	0.81	0.80	0.06	0.19	0.20
France	3180.24	2792.35	1508.36	0.87	0.87	0.60	0.13	0.13	0.40
Germany	3437.58	3563.97	1841.73	0.86	0.84	0.70	0.14	0.16	0.30
Greece	458.93	1350.70	3727.12	0.49	0.92	0.90	0.51	0.08	0.10
Hungary	737.71	238.88	1392.77	0.97	0.68	0.82	0.03	0.32	0.18
Ireland	2927.28	9995.46	4166.97	0.94	0.96	0.75	0.06	0.04	0.25
Italy	3584.69	2456.89	-325.85	0.87	0.84	0.42	0.13	0.16	0.58
Latvia	1132.44	-817.26	1907.09	0.93	0.98	0.88	0.07	0.02	0.12
Lithuania		-1139.87	1948.13		0.97	0.97		0.03	0.03
Luxembourg	10917.87	12074.34	7840.71	0.94	0.91	0.76	0.06	0.09	0.24
Malta	1976.54	2951.80	786.40	0.92	0.95	0.83	0.08	0.05	0.17
Netherlands	2416.78	4799.61	2575.21	0.93	0.95	0.74	0.07	0.05	0.26
Poland		1261.54	2028.82		0.91	0.92		0.09	0.08
Portugal	2228.20	2489.53	474.41	0.88	0.90	0.31	0.12	0.10	0.69
Romania	179.68	-263.70	1050.85	0.94	0.94	0.91	0.06	0.06	0.09
Slovak Republic		160.30	2928.60		0.23	0.93		0.77	0.07
Slovenia		1454.17	3132.45		0.88	0.82		0.12	0.18
Spain	2282.71	2743.21	1443.74	0.93	0.91	0.77	0.07	0.09	0.23
Sweden	4453.48	3707.58	3540.51	0.90	0.87	0.85	0.10	0.13	0.15
United Kingdom	4769.62	4508.72	2804.22	0.92	0.92	0.77	0.08	0.08	0.23

[10] **Source:** Author's own calculations

4.3 Literature Review

Studies about this topic have attracted many scholars recently. This methodology, which coined by Usher (1973) and developed by Rosen (1988), has been underlined in many studies.

Rosen (1988) pointed out that consumption elasticity is the main determinant of value of lifetime and if the intertemporal substitution is smaller, the willingness to pay for life extension increases, because if an individual is rich, he can give up more money for life extension. The income level affects the willingness of paying for gaining longevity.

Becker et al. (2005) investigated 49 countries between 1965 and 1995 and proved that although there was not income convergence, the full income convergence existed among these countries. Besides, they tried to explain the reduction of mortality with 13 different illness groups and compared the developing and the developed countries in terms of the effects of these diseases. According their results, the developed countries are affected from the illnesses more than the developing countries. The most interesting points proved in this study are the high income countries' welfare growth is lower than the developing countries and the positive effect of gaining longevity on welfare in the developing countries is more than in the developed countries.

Soares (2007) investigated the Brazilian municipalities between 1970 and 2000 and proved the increase in longevity at least 5 years and longevity convergence among municipalities. He explained the main causes of the mortality reduction such as, education, fresh water and sanitation.

Murphy and Topel (2003) proved that the higher level income can increase the longevity and willingness to pay for gaining longevity, whereas reduce the mortality rate and probability of taking sick.

4.4 The Unconditional β Welfare Convergence

4.4.1 Methodology

The same model which bases on Crespo-Cuaresma et al. (2002)'s model will be use to test the unconditional welfare convergence. The growth rate of welfare is the dependent variable and initial per capita income is the independent variable of the model. We defined the welfare as monetary value of gaining longevity and gaining income as equation (4.10) in a period. The value of gaining welfare will be zero in the beginning, because there is no gaining income or life expectancy initially. So, we calculate the income differences and the full income for each three ten year periods (1980-1989, 1990-1999 and 2000-2009). Our model is as follows,

$$g = \alpha + \beta . y_{t,i} + u_{t,i} \tag{4.20}$$

g shows the growth rate of welfare in terms of income and calculating with (4.18). $y_{t,i}$ is initial welfare (per capita income) of country i in period t (t is equal to 1980-1989, 1990-1999 and 2000-2009). α is constant term and $u_{t,i}$ is error term. The coefficient of β gives evidence about the existence of the welfare-convergence. The negative sign of β means that the welfare of poor countries increases faster than the rich countries.

4.4.2 Results

The regression results of model (4.20) are represented in Table (4.5). According to Hausman test (chi-square = 1.48 and p-val = 0.22), Random Effects GLS panel data regression is suitable for this model. Also, the model is overall significant, F-stat is 41.35 and p-val is 0.00.

Table 4.5: Unconditional β Welfare Convergence in EU (1980 - 2009)

Random Effects GLS Regression	Coefficient	Standard Error
α	0.3305***	(0.0244)
β	-5.55e-06***	(2.05e-06)
Observations	76	
R^2	within	0.0610
	between	0.1754
	overall	0.0467

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis. *** (**) [*] means 1% (5%) [10%] significant.

According to results, the estimated coefficient, -5.55e-06 (2.05e-06), has negative sign and is significant at 1% confidence intervals. There is an inversely relationship between welfare growth and initial level of welfare. Despite the not very high value of R^2 (4.6%), the highly significant results imply the existence of the unconditional β welfare-convergence among 27 EU countries. As seen in Figure 4.1, the welfare growth rate of the countries having high welfare level is smaller than the poor countries.

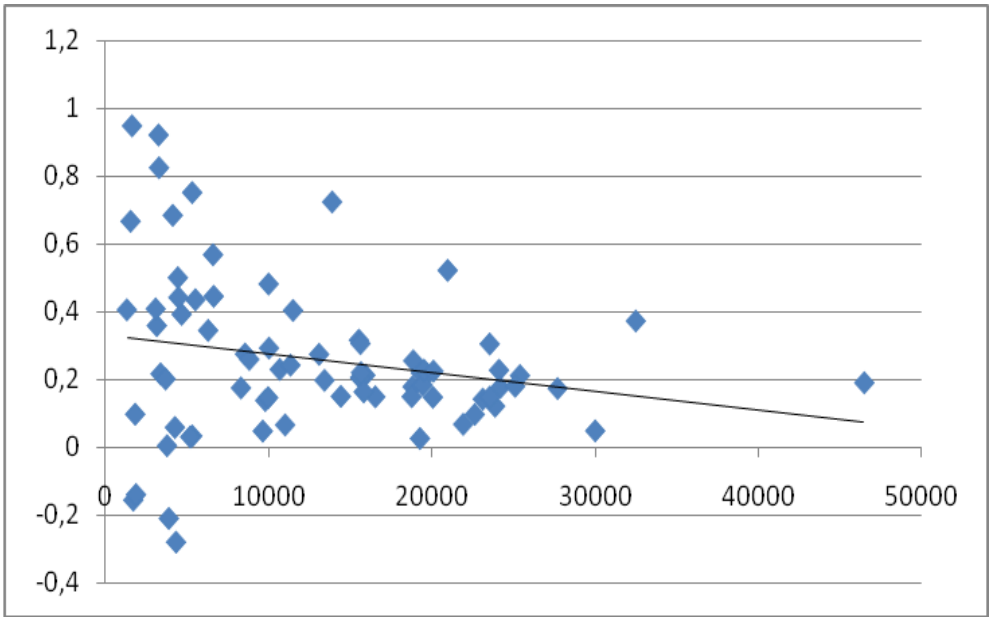

Figure 4.1: Welfare Growth Rate - Initial Welfare Level (1980 - 2009)

4.5 The Conditional β Welfare Convergence

4.5.1 Methodology

We will use Crespo-Cuaresma et al. (2002)'s model which was used for analyzing the conditional convergence among EU countries. This model testing conditional convergence of income and life expectancy in previous sections will be modified for monetary value of welfare as follows;

$$g = \alpha + \beta . y_{t,i} + \beta_2 . OPEN_{t,i} + \beta_3 . INF_{t,i} + \beta_4 . INV_{t,i} + \beta_5 . GOVEXP_{t,i}$$
$$+ \beta_6 . SCH_{t,i} + \beta_7 . NOY_{t,i} + \beta_8 . DUMMY_{t,i} + u_{t,i} \quad (4.21)$$

g is the welfare growth rate calculating with the equation (4.18), $y_{t,i}$ is the initial welfare level. The detailed information about the control variables is mentioned in Table 2.5. As defined before;

OPEN is the average yearly openness rate in t^{th} period for country i,

INF is the average yearly inflation rate in t^{th} period for country i,

INV refers the investment share in GDP in t^{th} period for country i,

GOVEXP is identified as the government expenditure share in GDP in t^{th} period for country i,

SCH implies the school attainment which is the average year of total schooling in t^{th} period for country i,

NOY means the length of the EU membership in t^{th} period for country i,

DUMMY is dummy variable gives 1 if a country is a member, unless the country is a member of EU, it is 0,

$u_{t,i}$ is error term,

n_t is the length of the period in terms of year.

4.5.2 Results

The regression results of model (4.21) are shown in Table (4.6). Fixed Effect panel data regression and Random Effects GLS panel data regression are compared with using Hausman Test. The results of chi-square=35.52 and p-val=0.00 showed that Fixed Effect panel data regression is so suitable for our model. Also, F-stat is equal to 12.98 and p-val is 0.00 means that our model is overall significant and the regression selected have the capability of explaining the growth rate of the monetary value of welfare. The regression has 72 observations and the value of R^2 is 0.35.

Table 4.6: Conditional Welfare Convergence in EU (1980 - 2009)

Fixed Effect (within) regression	**Coefficients**	**Standard Error**
Constant	0.0731	(0.4974)
Initial Welfare Level	-0.0004***	(0.0001)
Openness	0.0043***	(0.0019)
Inflation	-0.0029**	(0.0018)
Investment Rate	0.0086	(0.0085)
Government Expenditure Rate	-0.0073	(0.0112)
School Attainment	-0.0629	(0.0424)
Number of Year	0.0065	(0.0101)
Dummy	0.1623**	(0.0741)
Observations	72	
R^2	within	0.7373
	between	0.2003
	overall	0.3551

Note: All EU countries with data ranging from 1980 to 2009, divided into three periods: 1980-1989, 1990-1999 and 2000-2009. Robust standard errors in parenthesis. ***(**)[*] means 1% (5%) [10%] significant.

4.5.2.1 Initial Welfare Level

The estimated coefficient, -0.0004 (0.0001), is negative and highly significant. It is significant at 1% confidence intervals. The negative sign implies the existence of the conditional β welfare convergence that the developing countries' growth rate of the monetary value of gaining welfare in a period raises faster than the developed countries. However, the speed of the convergence is not very high (0.0043).

4.5.2.2 Openness

The openness, 0.0043 (0.0019), is positive and significant at 1% confidence intervals. The openness influences the growth rate of welfare about 0.006. The positive sign of the estimated coefficient of openness is expected because of the positive effects on per capita income and life expectancy.

4.5.2.3 Inflation

The estimated coefficient is negative and significant at 5% confidence intervals. The coefficient, -0.0029 (0.0018), influences the welfare negatively on impact by 0.004. As shown in previous sections, though the estimated coefficient of inflation is insignificant in conditional life expectancy convergence, the income is affected negatively and significantly from the inflation rate. So, the negative sign is acceptable result.

4.5.2.4 Investment Rate

There is positive relationship between investment rate and monetary value of the welfare. The estimated coefficient is positive but insignificant. The abolishment of tariffs in the borders of union can increase the investment in developing countries. So, this can affect the economic activities positively. Many studies touched on that the investment rate influence the GDP growth positively (Barro & Sala-i Martin, 2004, Crespo-Cuaresma et al., 2002). According to our results, the investment rate affects GDP per capita and longevity positively. So, it is expected that the sign of the estimated coefficient of investment rate is positive.

4.5.2.5 Government Expenditure Rate

Government expenditure rate affects the willingness of paying for the longevity inversely. The estimated coefficient, -0.0073 (0.0112), means that a one standard deviation increase in the government expenditure rate reduces the growth rate on impact by 0.008.

4.5.2.6 School Attainment

According to regression results, school attainment affects the growth rate of welfare on impact inversely by 0.1. The estimated coefficient, -0.0629 (0.0424), is not significant. In literature, school attainment has positive impact on income. It can be proposed that the school attainment affects the welfare positively by the impact of increasing value of income and life expectancy in last thirty years. However, the sign of the coefficient is negative and insignificant.

4.5.2.7 Number of Year

According to regression results, the length of the EU membership affects the growth rate positively by 0.0075. This means that the former member countries' welfare growth rate increases faster than the new member countries. The income is a fraction of our welfare function. So, the positive sign is expected, because length of membership is positively related with income (Crespo-Cuaresma et al., 2002). But, the estimated coefficient is not significant.

4.5.2.8 Dummy

Dummy variable measures the effect of the EU membership. The estimated coefficient, 0.1623 (0.0741), means that dummy variable increases the welfare growth rate on impact by 0.16. Dummy variable is significant at 5% confidence intervals. The results indicate that the monetary value of welfare of a country is affected positively if the country is a member of European Union.

4.6 σ Welfare Convergence

Full income distribution is represented in Figure 4.2. It is difficult to say the existence of σ convergence between 1980 and 2009, because β convergence is necessary but insufficient condition for σ convergence (Barro & Sala-i Martin, 2004). The coefficient of variation increased from 0.204 in 1980 to 0.25 in 1984. Although the dispersion went down to 0.159 in 1985, it sharply went up again to 0.413 in 1987. The dispersion started to reduce between 1987 and 1991 gradually. Also, the dispersion of the monetary value of the lifetime was about 0.2 between 1991 and 1997. After 2000, the dispersion decreased steadily. The dispersion decreased from 0.258 in 2000 to 0.178 in 2009. That is difficult to say that the σ convergence was provided between 1980 and 2009. However, especially in the periods of 1987 - 1998 and 2000 – 2009 the σ convergence was provided.

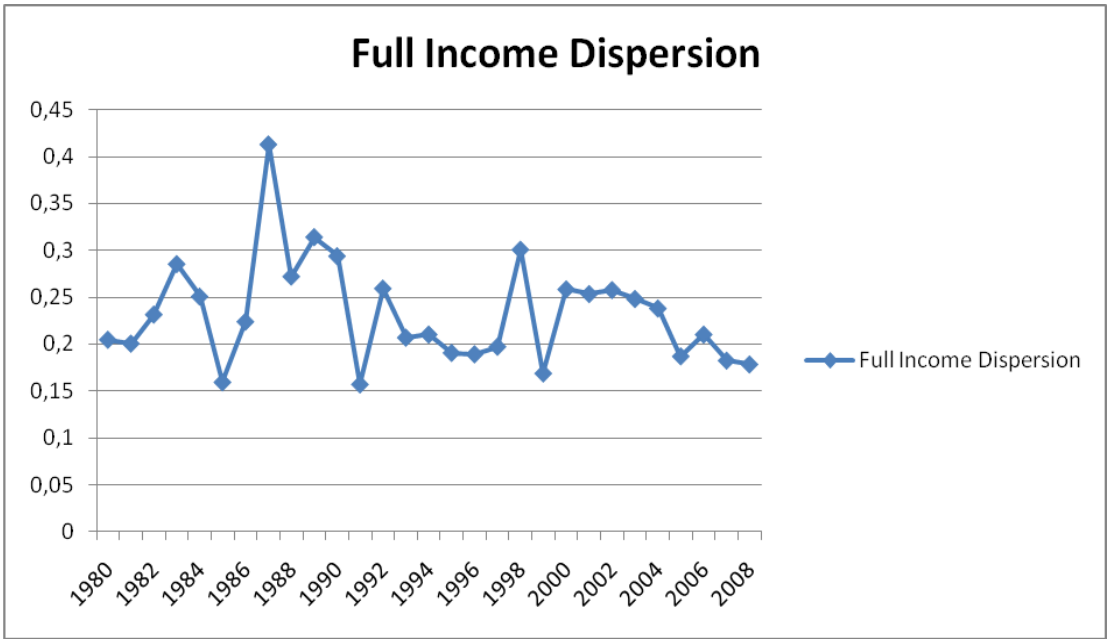

Figure 4.2: Full Income Dispersion (1980 - 2009)

4.7 Concluding Remark

In this chapter, the full income method was used to measure the monetary value of gaining life expectancy and added to the gaining income for obtaining the monetary value of overall gain in welfare. Also, convergence theory was used to prove the positive effects of EU membership. According to our results, there are unconditional and conditional β welfare convergence among EU countries. The EU countries having lower welfare level grow faster than the EU countries having higher welfare level. Besides, the membership enhances the welfare growth by at least 10%. However, it is hardly to say the existence of σ convergence among EU countries between 1980 and 2009. Although the welfare inequality between members has not decreased in last three decades, the welfares of poor countries tend to catch up the rich countries.

CONCLUSION

In the word of Becker et al. (2005), the quality of life is as important as the quantity of life, so both of these indicators affect the welfare. To analyse the welfare, we need to write both the longevity and income in same terms. So, the method of full income is used to obtain the monetary value of life expectancy.

The main aim of this thesis is representing the impact of EU membership on members' welfare which is defined as increasing living standards and life expectancy with using convergence theory. According to obtained results, EU membership influences the members' per capita income, longevity and welfare positively and developing countries tend to converge to the developed countries in union.

The positive effect on economic growth can be realized with the economic opportunities provided by union. As is seen, the minimum per capita income doubled and the maximum income growth by 261%, also the average real GDP per capita increased by 165% in last three decades. The estimated β coefficients, which are negative and highly significant, indicate the existence of unconditional and conditional convergence among 27 member countries. The unconditional and conditional β convergence speeds are 2.7% and 4.5% respectively. Besides, we used the dummy variable to guess about the effect of EU membership. According to results, the membership enhances the economic growth at least 12%. Although the income inequality between EU countries reached to top level in 1990s, it was decreased in the beginning of 2000s and reached to minimum level in 2009.

Another point which enhances the welfare is the life expectancy. In addition to former studies which proved the health expenditures convergence among members, the existence of life expectancy convergence in the union is shown. According to our findings, though there isn't unconditional β convergence, the conditional β convergence is provided among members. The EU countries which have lower life expectancy grow faster than the countries having higher life expectancy level. However, the convergence rate is not high. It is hardly to mention about the existence of σ life expectancy-convergence in last three decades.

The full income methodology is used to describe the welfare which is a combination of per capita income and longevity. Full income can be defined as the monetary value of lifetime in terms of income and the willingness of paying for gaining longevity in a period. So, the monetary value of welfare is obtained by this concept. It is proved that the welfare of members which have higher income per capita and life expectancy level grow slower than the countries which have lower income and life expectancy in union. This means that despite the slower convergence speed, there is β welfare convergence among EU countries. The income, life expectancy and welfare of developing countries which are generally new member countries tend to reach the level of developed countries in EU. Besides, the membership affects the welfare of the members positively and the membership enhances the welfare growth by 16%. The welfare was influenced negatively in 1990s but, the welfare inequality was achieved to decrease in 2000-2009 period as in per capita income and life expectancy.

Consequently, the EU members have economic opportunities provided by EU initially and they tend to achieve the goal of reaching the level of high income countries. In addition to increasing income level, the abolition of borders and transferring of technology, capital and investments help to increase the life expectancy. Finally, the welfare of union increases as a result of increasing quality and quantity of life.

BIBLIOGRAPHY

Abramovitz, M. (1986). Catching up, forging ahead and falling behind, *Journal of Economic History, 46(2), 385-406.*

Agan, Y., Sevinç E. & Orhan M. (2009). Impact of main macroeconomic indicators on happiness. *European Journal of Economic and Political Studies,* 2(2), 13-21.

Aghion, P., Peter, H. & Fabrice M., (2010). The relationship between health and growth: when Lucas meets Nelson-Phelps. *NBER Working Paper,* 15813.

Badinger, H. (2005). Growth effects of economic integration: Evidence from the EU member states. *Review of World Economics, 141,* 50-78.

Barro, R. J. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics,* 106(2), 407-433.

Barro, R. & Sala-i Martin H. (1992). Convergence. *Journal of Political Economy*, 100, 223-251.

Barro, R. J. (1997). *Determinants of Economic Growth: A Cross-Country Empirical Study*. Cambridge, MA: MIT Press.

Barro, R. J. and Lee, J. W. (2001). International data on educational attainment: updates and implications. *Oxford Economic Papers*, 53, 541—563.

Barro, R. & Sala-i Martin H. (2004). *Economic growth*. MIT Press.

Baum, J.K., Myers, R.A., Kehler, D.G., Worm, B., Harley, S.J., & Doherty, P.A., (2003). Collapse and conservation of shark populations in the Northwest Atlantic. *Science,* 299, 389–392.

Baumol, W. J. (1986). Productivity growth, convergence, and welfare: what the long-run data show. *American Economic Review, 76,* 1072–1085.

Becker, G. S., Philipson, T. J. & Soares, R. R., (2005). The quantity and quality of life and the evolution of world inequality. *American Economic Review, 95 (1)*, 277–291.

Beugelsdijk, M. & Sylvester C.W. (2005). The effectiveness of structural policy in the European Union: An empirical analysis for the EU-15 in 1995-2001. *Journal of Common Market Studies*, 43, 37-51.

Bloom, D., Canning, D., & Sevilla, J., (2001). The effect of health on economic growth: Theory and evidence. *NBER Working Paper*, 8587.

Borts, G. H., & Stein J. L. (1964). *Economic Growth in a Free Market.* New York, Columbia University Press.

Caves, R.E. & Barton, D.R. (1990). *Efficiency in US manufacturing industries*. MIT Press Cambridge, Mass.

Crespo-Cuaresma, J., Dimitz, M. A. & Ritzberger-Grünwald, D., (2002). Growth effects of European integration: Implications for EU enlargement. *Austrian National Bank, Focus on Transition*, 1, 87–100.

De Long, J. B. (1988). Have productivity levels converged? Productivity growth, convergence, and welfare in the very long run. *American Economic Review, 78*, 1138–1154.

Dinan, D. (2004). *Europe Recast: A History of European Union*. London: Palgrave.

Dowrick, S. & Nguyen, D. T. (1989). OECD comparative economic growth, 1950–85: catch-up and convergence. *American Economic Review,* 79, 1010–1030.

Drabo, A. (2010). Income inequality and health status: role of institutions quality. *Economics Bulletin*, 30(4), 2533-2548.

Easterlin, R. A. (1960). Regional growth of income: long-run tendencies. *Population Redistribution and Economic Growth, United States,* 1870-1950.

Falk, M. & Sinabell, F., (2008). The effectiveness of objective 1 structural funds in the EU 15: New empirical evidence from NUTS 3 regions. *Working Paper 310, WIFO.*

Harrison, A. (1996). Openness and growth: A time- series, cross-country analysis for developing countries. *Journal of Development Economics*, 48(2), 419-447.

Henrekson, M., Torstensson, J. & Torstensson, R. (1997). Growth effects of European integration. *European Economic Review, 41(8),* 1537-1557.

Kar, M. & Arıkan, H. (Eds). (2003). Avrupa Birliği ortak politikalar *ve* Türkiye. *İstanbul: Beta Press.*

Karluk, S. R. (1998). Avrupa para birliği, Euro ve geleceği. *Anadolu Üniversitesi İİBF Dergisi, 14(1), 261-293.*

Kerem, K., Puss, T. & Maldre, R. (2008). Health and convergence of health care Expenditure in EU. *International Business and Economics Research Journal,* 2, 29–43.

Kutan, A. M. & Yiğit T. M. (2007). European integration, productivity growth and real convergence, *European Economic Review, 51,* 1370-1395.

Lee, J. W. (1992). International trade, distortions and long-run economic growth. *International Monetary Fund, Research Department.*

Levine, R. & David R. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82(4), 942—963.

Macdonald, J. M. (1994). Does import competition force efficient production? *Review of Economics and Statistics, 76(4):* 721-727.

Murphy, K. & Topel R. (2003). The economic value of medical research. In: K. Murphy & R. Topel (Eds). *Measuring the Gains from Medical Research: An Economic Approach*. The University of Chicago Press.

Nixon, J. (1999). Convergence analysis of health care expenditure using two approaches. *Discussion Papers in Economics,* 99(3), University of York.

Nordhaus, W. (2002). The health of nations: the contribution of improved health to living standards. In K. Murphy & R. Topel (Eds.), *The Economic Value of Medical Research.* Chicago: University of Chicago Press.

Özbay, P. (1997). Avrupa para birliği ve Euro. *Central Bank of the Republic of Turkey General Directorate of Research, 9702.*

Penn World Table 6.3, http://pwt.econ.upenn.edu/ (Accessed February 2011)

Quah, D. T. (1993). Galton's fallacy and tests of the convergence hypothesis. *The Scandinavian Journal of Economics*, *95*, 427-443.

Rassekh, F., Panik, M. J. & Kolluri, B. R. (2001). A test of the convergence hypothesis: the OECD experience, 1950-1990. *International Review of Economics & Finance,* 10(2), 147-157.

Reza, R. & Zahra, K. T. (2008). Evaluation of the income convergence hypothesis in ten new members of the European Union. A panel unit root approach. *Panoeconomicus, 2,* 157-166.

Rosen, S. (1988). The value of changes in life expectancy. *Journal of Risk and Uncertainty*, 1, 285-304.

Sachs, J. & Warner A. (1995). Economic reform and the process of global integration (with discussion). *Brookings Papers on Economic Activity*, 1, 1-118.

Sala-i Martin H. (1995). Regional cohesion: evidence and theories of regional growth and convergence. *Centre for Economic Policy Research, Discussion Paper No: 1075*.

Sala-i Martin, X., Doppelhofer G., & Miller R. (2004). Determinants of long-term growth: a bayesian averaging of classical estimates (BACE) approach. *American Economic Review,* 94(4), 813-36.

Soares, R. R. (2007). Health and the evolution of welfare across Brazilian municipalities. *Journal of Development Economics*, 84(2), 590-608.

Streissler, E. (1979). Growth models as diffusion processes: II. *Kyklos*, 32(3), 571–586.

Usher, D. (1973). An imputation of the measure of economic growth for changes in life expectancy. In M. Moss (Eds.). *The Measurement of Economic and SocialPerformance*, 38, 193-225, New York, National Bureau of Economic Research and Columbia University Press.

Vanhoudt, P., (1999). Did the European unification induce economic growth? In search of scale effects and persistent changes. *Review of World Economics*, 135(2), 193-220.

World Databank- World Development Indicators & Global Development Finance, http://data.worldbank.org/ (Accessed February 2011)