Regional Convergence in Turkey Regarding Welfare Indicators[1]

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Türkiye'de Refah Göstergeleri Açısından Bölgesel Yakınsama[2]

Abstract

The main aim of this study is to investigate conditional convergence by using welfare indicators at NUTS 2 level in Turkey. We use cross-section analysis for the 1990-2001 time period for the aim of the study. Three growth indicators were used as the dependent variable, which are per capita GDP, per person employed GDP and development index. Hence, the effects of illiterate population rate, high school graduated rate, public capital per person, population growth rate on convergence were investigated. The results of this study show that there is some evidence of unconditional convergence in Turkey in general. Moreover, the results indicate that socio-economic indicators have no effect on regional growth in general. Only the population growth rate which is used in the analysis and per capita GDP as dependent variable has negative and significant results.

Keywords   :   Regional Development, Conditional Convergence, Cross-section Analyzes, Welfare Indicators.

JEL Classification Codes :   R11, R15, C51.

Öz

Bu çalışmanın temel amacı Türkiye'de Düzey 2 bölgeleri açısından refah göstergelerini kullanarak koşullu yakınsamayı incelemektir. Çalışmanın amacı için 1990-2001 dönemleri için kesit veri analizi kullanılmıştır. Bu çalışmada bağımlı değişken olarak, kişi başına GSYİH, işçi başına GSYİH ve gelişme endeksi olmak üzere üç büyüme ölçütü kullanılmıştır. Böylece bölgelerdeki okuma yazma bilmeyen nüfus oranı, lise veya lise dengi meslek okulu mezunlarının oranı, kişi başına kamu sermayesi ve nüfus artış hızı gibi değişkenlerin bölgesel farklılıklarının azaltılmasında, bir rolü olup olmadığı incelenmiştir. Çalışma sonuçları Türkiye'de genel olarak koşullu yakınsama için bazı kanıtlar olduğunu göstermektedir. Ayrıca, çalışma sonuçları sosyo-ekonomik göstergelerin genel olarak bölgesel büyüme üzerine etkisi olmadığını göstermektedir. Bağımsız değişken olarak yalnızca nüfus büyüme oranı ve kişi başına GSYİH negatif ve anlamlı sonuca sahiptir.

Anahtar Sözcükler   :   Bölgesel Kalkınma, Koşullu Yakınsama, Kesit-veri Analizi, Refah Göstergeleri.

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1. Introduction

Regional disparities have been one of the most important problems in most of the countries. In this respect, the question of whether income levels of different economies tend to converge over the time has been one of the most important questions in recent years. Hence, regional convergence has gained a growing attention and there have been considerable amount of empirical studies in this area. These studies have mainly focused on the evolution of economic disparities and the process of convergence between the more developed and less developed countries or between the regions in a country (see, for example, Baumol, 1986; Barro and Sala-i-Martin 1991; Mankiw et al 1992; Loewy and Papel, 1996; Kılıçaslan and Ozatagan 2007; Önder et al 2010).

The regional inequalities have long been important issue in regional development policy in Turkey. Regarding this, there have been a number of studies concerning regional convergence in Turkey (see, for example, Filiztekin, 1998; Tansel and Gungor, 1998; Karaca 2004; Yildirim, 2005; Kılıçaslan and Ozatagan 2007; Önder et al 2010; Karaalp and Erdal 2012).

However, when results of the empirical studies are examined, it can be seen that the authors do not have same conclusions about convergence hypothesis. While some of these studies support the hypothesis, some of the other studies do not. For instance, Karaalp and Erdal carried out a research to investigate the effects of agglomeration economies and growth of neighbors on regional income disparities. The estimation results of their study reveal that income disparities decrease by time for 73 provinces. Önder et al t al (2010), estimated a conditional convergence model based on per capita GDP and public capital using the panel data set of Turkish regions at NUTS 1 level for the time period 1980-2001[3]. Results of their study show existence of σ-convergence, but they could not find significant effect of public capital on regional convergence. Karaca (2004) investigated effects of public policies on decreasing income inequalities for the time period 1975-2000. He used measures of ß-convergence and σ-convergence in order to test convergence hypothesis and found that income inequalities increased for the time period 1975-2000. Filiztekin (1998) investigated convergence in Turkish provinces for the time period 1975-1995. He used per capita income data and the results showed that there was not unconditional ß-convergence but showed existence of conditional ß- convergence for the provinces of Turkey.

Despite the fact that there are some studies analyzing regional convergence in Turkey, there appear to be a few studies related to which factors may affect regional convergence as far as Turkey is concerned (See Gezici & Hewings, 2004; Yildirim, 2005; Önder et al 2010; Karaalp and Erdal 2012). On the other hand, to the authors' best

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[3] *As some of the data available until 2001 only, we are restricted to the time period between 1990 and 2001. For example, data related to public capital were only available until 2001 at NUTS II level.*

knowledge, there appears to be no study to investigate conditional convergence by using welfare indicators regarding the Turkish regions.

Thus, the main aim of this study is to investigate conditional convergence by using welfare indicators at the NUTS II level in Turkey for the 1990-2001 time period.

The remainder of this paper is organized as follows. The next section provides information about the data set and the methodology used in the study. Evaluation of the results are summarized and discussed in section three. The paper concludes with a summary analysis of the findings in section four.

2. Data and Methodology

In this study, we used the data set for the regions at NUTS II level for the time period between 1980 and 2001. We use cross-section analysis for the time period under consideration. Regarding this, three growth indicators were used as dependent variable, which are per capita GDP, per person employed GDP, and development index. The effects of illiterate population rate, high school graduated rate, public capital per person, population growth rate on convergence were investigated. The data set employed in this study obtained from several sources of Turkish Statistical Institute (TURKSTAT) and State Planning Organization (reorganized as the Ministry of Development in 2011).

The question of whether income levels of different economies tend to converge is one of the most important questions that was first discussed in 1956 by Solow in his economic growth study and still has been discussed since then. According to Neoclassical Growth Model, economies of different regions convergence to each other because of diminishing returns of physical capital. When more and more capital is employed, marginal productivity of capital decreases. As a result, the economies starting out with a lower physical capital base will experience higher growth rates and eventually converge to the rich ones.

As it is widely known that since the publication of the path breaking articles by Barro and Sala-i-Martín (1991; 1992), there has been a great interest in the analysis of regional convergence. Basically, Barro and Sala-i-Martín have popularized the use of the key concept of beta convergence that shows whether those regions that start with lower levels of income per capita or labor productivity later record higher growth rates than those with higher initial levels. That means, all economies should eventually converge in terms of per capita income. Hence, convergence can be defined as two or more countries or regions becoming similar in the development of certain economic variables such as, income per capita and economic growth rate.

Regarding convergence, three main concepts have been used in a great deal in the literature, namely, unconditional (or absolute) β-convergence, conditional β-convergence, and σ- convergence. In general, β-convergence refers to the negative correlation between initial per capita income level and subsequent growth rates and hence the coefficient has a negative sign in regression analysis. On the other hand, sigma (σ) convergence is standard deviations of the cross-sectional dispersion of income level or growth rates of economic units. Regarding this, if standard deviation of income levels reduces over time, that means (σ) convergence. In that type of convergence, the coefficient of variation can also be used instead of standard deviation (see also Karaca, 2004). Unconditional β-convergence (absolute convergence) states that all economies are similar in terms of institutional structure, saving rates, and technology and they only differ by their initial conditions of per capita incomes, and move towards a common steady-state. That type of convergence is tested by correlating the initial level of income and its subsequent growth for a given set of cross-section data. On the other hand, conditional β-convergence, states that economies are not similar and hence they may move towards different steady-states. In other words, the conditional convergence hypothesis depends on the structural characteristics of each economy and equilibrium differs by the economy, and each economy approaches its own but unique equilibrium. That type of convergence is tested in a similar way, but this time under the assumption that the influence of other factors is held constant (partial correlation).

Lastly, σ-convergence mentions that per capita income disperse at given moments in time. That kind of convergence is shown terms of the standard deviation[4]. In other words, sigma σ -convergence is standard deviations of the cross-sectional dispersion of income level or growth rates of economic units. Regarding this, if standard deviation of income levels reduces over time, that means σ -convergence. In that type of convergence, the coefficient of variation can also be used instead of standard deviation (see also Karaca, 2004).

Following Michelis and Papadopoulos (2004), in this study unconditional convergence is tested with cross-section analysis by using the following model[5]:

$$\ln(Y_{it} / Y_{i,0}) = \alpha + \beta \ln Y_{i,o} + \varepsilon \tag{1}$$

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[4] Also, see Canaleta et.al. 2002: Karaca 2004; Ozgul 2009 and Artelaris et.al. 2010 for the details about convergence.

[5] Also there are some empirical studies to study convergence by using non-linear models in recent years (see, for example, Costa and Iezzi 2004, Artelaris et.al. 2010; Azomahou et.al 2011).

Where, Y_{it} is log value of GDP per capita in region i in year t, $Y_{i,0}$ is the initial log value of GDP per capita in region i in year 1991, α and β are constants, while ε is the error term.

Conditional convergence model is tested with the following model. Some socio-economic factors which can affect convergence is added to the first model.

$$\ln(Y_{it} / Y_{i0}) = \alpha + \beta \ln Y_{io} + \delta \ln V_{i0} + \varepsilon \qquad (2)$$

Where V_{i0} a value of vector of variables is aimed at capturing the physical and human capital characteristics of region i that can affect the economics growth of the region.

3. Empirical Results

3.1. Regional Sigma Convergence

Before examining the conditional convergence model, we investigated sigma convergence for NUTS II regions in Turkey for the time period 1990-2001. Table 1 shows results of σ- convergence.
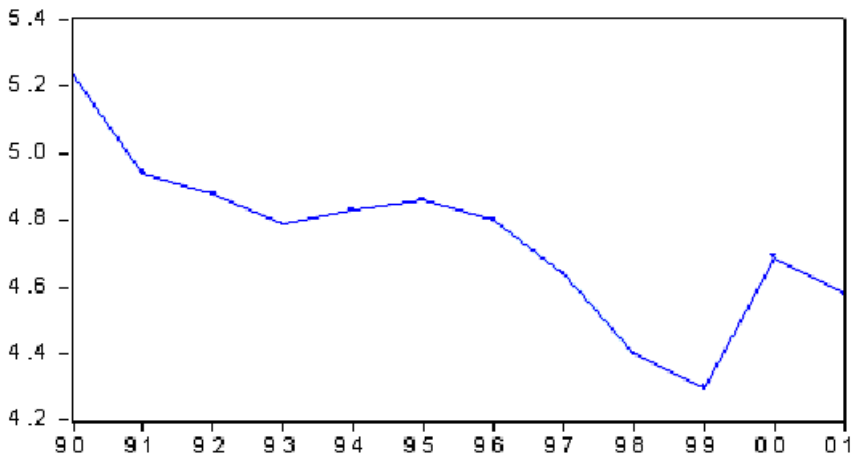
Table: 1
Per Capita Income, Standard Deviation and Coefficient of Variation

Years	Per Capita Income	Standard Deviation	Coefficient of Variation
1990	9.37	0.49	5.23
1991	9.37	0.46	4.94
1992	9.41	0.46	4.88
1993	9.47	0.45	4.79
1994	9.40	0.45	4.83
1995	9.44	0.46	4.86
1996	9.50	0.46	4.80
1997	9.58	0.44	4.64
1998	9.61	0.42	4.40
1999	9.55	0.41	4.30
2000	9.55	0.45	4.69
2001	9.48	0.43	4.58

As can be seen from the table, when per capita income increases, coefficient of variation and standard deviation tend to decrease. The table shows that standard deviation of per capita income of the regions was 0.49 in 1990 and decreased to 0.43 in 2001. Hence, we can say that convergence exists between the regions in Turkey for the time period.

Alternative to σ –convergence, coefficient of variation which is calculated by dividing standard deviation to the average can also be used. If the coefficient of variation decreasing by years, it shows existence of convergence, otherwise it shows divergence. Regarding this, coefficient of variation shows similar results as standard deviation. According to Table 1, coefficient of variation was 5,23 in 1990, and it was 4,58 in 2001. It shows income inequalities tend to decrease in regions between the years 1990-2001 so this indicates convergence. Coefficient of variation of per capita GDP between 1990 and 2001 is presented in Figure 1.

Figure: 1
Coefficient of Variation

As can be seen from table 1 and from figure 1, convergence is mostly based on the time period of 1995-1999. Coefficient of variation was 4.86 in 1995, and decreased to 4.30 in 1999.

3.2. Regional Unconditional Beta Convergence

Firstly, we used a diagram to show the relationship between the growth speed of real GDP and the initial logarithm values. The following figure shows this relationship.

As the figure shows, the growth rate and initial real GDP per capita have negative relationship which indicates the existence of beta-convergence.

Results of estimation of equation (1) shows the estimation of beta-convergence. The estimation results of this equation is given in Table 2.
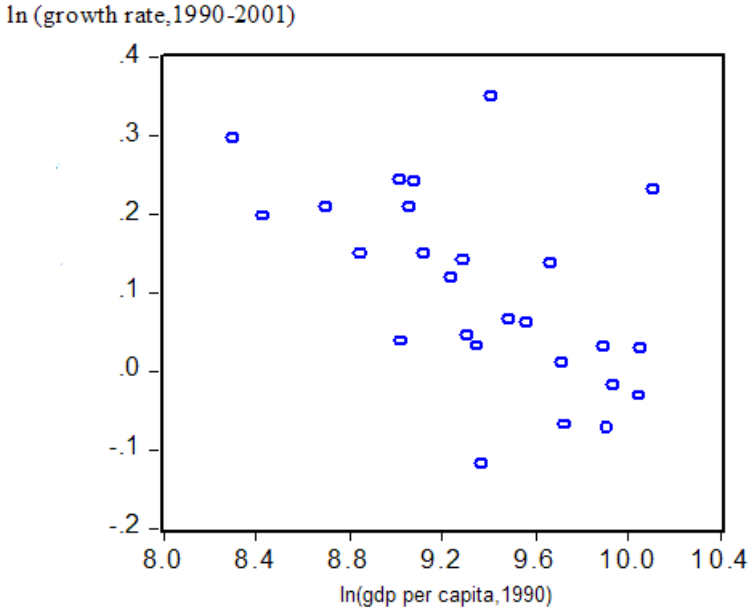
Figure: 2
Beta Convergence

ln (growth rate,1990-2001)

Table: 2
Cross-Section Growth Regression, Unconditional Convergence

Independent Variables	
Constant Coefficient	1.4032
	(3.58)*
Initial (1990) per Capita GDP	-0.1386
	(-3.32)*
R^2	0.315
N	26

Dependent Variable: Logarithm of growth rate of per capita GDP for the NUTS II regions for the period of 1990-2001.
Values in the parenthesis are t-statistics.
* Significant for 1% level.

As the table shows, coefficient of initial GDP per capita variable is negative (-0.1386) as we expected. The result confirms the diagram in figure 2. Hence, we can say that these results support unconditional convergence for the NUTS II regions for the time period of 1990-2001. The explanatory power of the simple model is 31.5%. This result is in line with the studies by Sağbaş (2002), and by Doğruel and Doğruel (2003).

3.3. Regional Conditional Beta Convergence

Conditional beta-convergence is estimated by using equation 2. As mentioned before, V shows variables which can affect the growth rate of a region. In this respect four variables are tested, namely, illiterate population rate, high school graduated rate, public capital per person and population growth rate. Table: 3 presents the estimation results of conditional beta-convergence.

Table: 3
The Estimation Results Regarding Conditional Convergence

Independent Variables	
Constant Coefficient	1.9648
	(1.60)
Initial (1990) per Capita GDP	-0.1952
	(-2.19)**
Illiterate Population Rate	-0.0676
	(-0.48)
Public Capital per Person	0.0597
	(1.34)
High School Graduated Rate	0.0186
	(0.14)
Population Growth	-0.0033
	(-2.05)**
R^2 (adjusted)	0.4168

Dependent Variable: Logarithm of growth rate of per capita GDP for the NUTS II regions for the period of 1990-2001.
** Significant for 5% level.

As can be seen from the table coefficient of initial per capita GDP variable has negative sign (-0.1952) and it is statistically significant. It means that there exists convergence between the regions in Turkey. In other words, regions which had lower growth rate initially, grew at a higher rate compared to the regions which had higher growth rate. Except initial per capita GDP, only population growth rate is statistically significant. Negative coefficient of this variable indicates that population growth rate has negative relationship with convergence in the NUTS II regions. When we look at the effect of illiterate population rate on income convergence, coefficient of variable is negative as we expected. However, this variable does not have significant affect which means that it does not contribute to the convergence within the NUTS II regions in Turkey. Coefficient of public capital per person is positive which is in line with the results of Önder et al (2010). However, this variable is statistically insignificant which means that there is no relationship between growth rate and public capital. Coefficient of high school graduated rate variable has a positive sign as expected. Nonetheless, this variable does not have an effect on convergence as the coefficient is statistically insignificant. The explanatory power of the model is 41.68%.

3.4. Growth of GDP per Person Employed and Regional Convergence

Another type of measures of regional inequalities is growth of GDP per person employed. Regarding this, sigma convergence (σ-convergence) is investigated for the NUTS II regions for the time period of 1990-2001. Table 4 shows the results of σ-convergence.

Table: 4
Average GDP per Person Employed, Standard Deviation and Coefficient of Variation

Years	Average	Standard Deviation	Coefficient of Variation
1990	10.22	0.52	5,08
2001	10.48	0.43	4,10

As can be seen from the table, average GDP per person employed increased, while coefficient of variation and standard deviation decreased for the time period under consideration. Regarding this, standard deviation of per person employed GDP was 0.52 in 1990 and it was 0.43 in 2001. Hence, we can say that there exists convergence for the NUTS II regions for the time period under consideration. Coefficient of variation gives similar result as standard deviation as can be seen from the table. Related to this, coefficient of variation was 5.08 in 1990, while it was 4.10 in 2001. Therefore, we can conclude that there is tendency of convergence for GDP per person employed for the Turkish regions. Table 5 shows regression results of unconditional convergence (GDP per person employed is used as dependent variable).

Table: 5
Cross-Section Growth Regression, Unconditional Convergence

Independent Variables	
Constant Coefficient	2.0774
	(7.92)*
Initial (1990) per Person Employed GDP	-0.1777
	(-6.93)*
R^2	0.667
N	26

Dependent Variable: Logarithm of Growth of per Person Employed GDP for the NUTS II regions for the time period of 1990-2001.
Values in the parenthesis are t-statistics.
* Significant for 1% level.

As we expected coefficient of initial per person employed GDP has negative sign (-0.1777). Therefore, we can say that there is unconditional convergence for the NUTS II regions for the time period of 1990-2001. The explanatory power of the model is 66.7%. The results are in line with Michelis *et.al.* (2004).

Table 6 shows result of conditional convergence regression which per person employed GDP is used as dependent variable.

Table: 6
Cross Section Growth regression, Conditional Convergence

Independent Variables	
Constant Coefficient	1.8027
	(2.41)**
Initial (1990) per Person Employed GDP	-0.1906
	(-3.42)*
Illiterate Population Rate	-0.0629
	(-0.73)
Public Capital per Person	0.0033
	(-0.10)
High School Graduated Rate	0.1341
	(1.36)
Population Growth	-0.0013
	(-0.99)
R^2 (adjusted)	0.6391

Dependent Variable: Logarithm of Growth of per Person Employed GDP for the NUTS II regions for the period of 1990-2001.
* Significant for 1% level.
** Significant for 5% level.

Coefficient of Initial per person employed GDP has negative sign and it is statistically significant. Other variables do not give significant results. The explanatory power of the model is 63.9%.

3.5. Development Index and Regional Convergence

Development index is used as dependent variable and results regarding this are presented in Table 7.

Table: 7
Development Index, Standard Deviation

Years	Standard Deviation
1990	0.10
2000	0.09

As we can see, standard deviation is 0.10 in 1990 and it decreases to 0.09 in 2000. We can say that there is a slight sigma convergence for the NUTS II regions for the time period under consideration.

Table 8, shows the results of unconditional convergence regression in which development Index is used as dependent variable.

Table: 8
Cross-Section Growth Regression, Unconditional Convergence

Independent Variables	
Constant Coefficient	-0.0224
	(-4.38)*
Initial (1990) Development Index	-0.1594
	(-10.27)*
R^2	0.807
N	26

Dependent Variable: Logarithm of Growth of Development Index for the NUTS II regions.
* Significant for 1% level.

As we can see from the table, coefficient of initial development index has negative (-0.1594) sign and is statistically significant. Hence, we can say that unconditional β convergence exists for the time period of 1990-2000. The explanatory power of the model is 80%. Again the results are in line with Michelis *et.al.* 2004. Table 9 shows result of conditional convergence regression which development Index is used as dependent variable.

Table: 9
Cross- Section Growth Regression, Conditional Convergence

Independent Variables	
Constant Coefficient	-0.0116
	(-0.19)
Initial (1990) Development Index	-0.1777
	(-3.41)*
Illiterate Population Rate	-0.0068
	(-0.38)
Public Capital per Person	0.0040
	(1.02)
High School Graduated Rate	0.0044
	(0.34)
Population Growth	0.0000713
	(-0.51)
R^2 (adjusted)	0.79

Dependent Variable: Logarithm of Growth of Development Index for the NUTS II regions for the time period of 1990-2001.
* Significant for 1% level.
** Significant for 5% level.

As we can be seen from the table only coefficient of initial development index is significant and it has negative sign as we expected. Hence, we can say that there is no conditional convergence for the NUTS II regions for the time period of 1990-2000.

4. Conclusion

The main aim of this study is to investigate regional convergence and the effects of some wealth indicators on convergence in the Turkish regions at NUTS II level. As mentioned before, three growth indicators were used as the dependent variables, namely, per capita GDP, per person employed GDP and development index. Hence, the effects of illiterate population rate, high school graduated rate, public capital per person, population growth rate on convergence were investigated. Results of this study show that there exists evidence of unconditional convergence in Turkey in general. Most of the socio-economic indicators that are used in the analysis have no significant effects in regional growth in Turkey in general. Only the population growth rate has negative and significant result.

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