Economic Development and Convergence in Turkey:

A Province-Based Assessment with a Special Emphasis on

the Southeastern Anatolia Project (GAP)

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ABSTRACT

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The first aim of this study is to investigate whether there are improvements in the development levels of the most developed, developed, and GAP provinces in Turkey, and also whether there exists convergence in labor productivity levels and the growth rates of productivity between the most developed, developed and GAP provinces in Turkey between the years 1975 and 2000. The second aim is to draw conclusions about whether the Southeastern Anatolia Project, designated as an integrated development project in the 1990s, has any positive effect on the convergence pattern of the cited provinces. This study shows that there is β (beta) convergence in the labor productivity levels and the growth rates of the productivity of the sample consisting of the most developed, developed, and GAP provinces in Turkey. However, the development levels of the cited provinces regarding the Human Development Index and the mean years of the labor force's schooling do not change substantially over the time period 1975-2000. Although GAP causes an increase in the rate of the unconditional convergence in single cross-sectional regressions for the entire sample, it seems to have no positive effect on the convergence rate conditional on the human capital variable.

KEYWORDS: Regional development, Income convergence, Human Development Index (HDI), Human capital, Mean years of the schooling.

KISA ÖZET

Türkiye'de Ekonomik Kalkınma ve Yakınsama:

Güneydoğu Anadolu Projesi'ne (GAP) Özel Vurgu ile

İllere Dayalı Bir Değerlendirme

Elif Onmuş

Bu çalışmanın temel amacı 1975-2000 yılları arasında Türkiye'deki en gelişmiş, gelişmiş ve Güneydoğu Anadolu Projesi (GAP) kapsamında yer alan illerin kalkınma düzeylerindeki değişimleri ve aynı iller arasında verimlilik düzeyleri ve büyüme oranları açısından yakınsamanın varlığını araştırmaktır. İkinci amaç ise GAP'nin söz konusu illerin yakınsama patikası üzerinde yaptığı etkinin yönünü saptamaktır. Bu çalışma verimlilik düzeyleri ve büyüme oranları kullanılarak en gelişmiş, gelişmiş ve GAP illerinden oluşan örneklemde β (beta) yakınsamasının varlığını göstermektedir. Ancak, İnsani Gelişme Endeksi (İGE) ve iş gücünün ortalama eğitim süresi temel esas alınarak yapılan analizde seçilen illerin kalkınma düzeylerinde önemli bir değişme olmadığı gözlemlenmektedir. Ayrıca, yatay kesit veri analizde GAP seçilen illerin koşulsuz yakınsama oranında bir artışa neden olduğu halde, yakınsama oranının insani sermaye değişkeni üzerine koşullandırıldığı durumda olumlu bir etki yaratmamaktadır.

ANAHTAR KELİMELER: Bölgesel kalkınma, Gelir yakınsaması, İnsani Gelişme Endeksi (İGE), İnsani sermaye, Ortalama eğitim süresi.

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1. INTRODUCTION

Just as there are differences among countries in terms of per capita income levels, the quality of human capital, and life expectancy, the same differences might also exist within a country among its regions. Regional disparities can be seen in many countries regardless of the fact that those countries are developed or undeveloped. As stated in Shaoguang and Angang (1999), uneven development is a common problem for both large developing countries such as India, Mexico, and Brazil as well as developed countries such as the United States, Great Britain, France, Italy and Canada.

Regional inequality is an important issue for economic growth of any country. Although the Neoclassical Growth Theory asserts that initially poor regions catch up with their rich counterparts because of faster growth rates, there are significant examples of regional disparities in a country as previously stated. The assertion of faster growth rates is based on the assumption of diminishing returns to capital, that is, an increase in the capital stock will create higher output when the capital stock is small. In this respect, one could raise an important question: Why do growth rates differ across regions and what are the main factors that trigger these diversities?

Even though economic growth is not the only determinant of development, it is a key indicator of it. Whereas a country may show a high growth rate, income disparities among its regions can also extend to an undesired level. Since some regions are intrinsically endowed with abundant resources, they benefit from rapid growth, while the others lacking resources become disadvantaged. Myrdal (1957) gives a simple illustration to account for regional disparities within a country. His example begins with an adverse shock to one locality in a country. In the example, a factory providing the majority of a population with income burns down; this, in turn, causes business to be closed and workers in that locality to be unemployed. Because of the lower incomes demand decreases that, in return, again lowers the incomes affecting adversely all other types of businesses that provide goods and services with the firm and its unemployed workers. The vicious cycle goes on if no other exogenous changes occur in that community. Unemployed workers then leave the area in order to find better markets thereby changing the age structure of that locality. He also states that just as there are adverse shocks to some regions which make them backward, there may be an initial change that gives a better result for some other regions in a country. Myrdal's main argument in the book is that if the initial change has large and persistent effects, the market forces unrestricted by any policy give an increase to the disparities among regions.

As mentioned before, regional differences can be seen in all countries regardless of the fact that they are developed or undeveloped. The same argument is also valid for Turkey. Human Development Report (HDR)[1] (1997) attracts our attention to differences in both the regional and provincial level in Turkey. It states that the human development concept in Turkey started with the declaration of the Republic, and that also political leaders in those years gave importance not only to economic development, but to social development as well. While infrastructure projects and economic growth were given priorities before the 1950s; with the establishment of the State Planning Organization in 1960 the situation did change. Turkey had a desired level of economic growth in the 1970s, but the oil shock in 1973 affected the country adversely, and this caused the inflation to increase to two-digit numbers. After liberalization in 1980, Turkey had a robust economic growth, in the meantime, failure in privatization and decreasing inflation raised income differences between the poor and the rich regions of the country. While the majority of the poorest provinces were located in GAP[2] region, a small number of them were in Aegean region. Furthermore, in Turkey, some provinces in the same geographical region show dissimilarities to the others in their region in terms of not only levels of income but also in other standards of living.

The Human Development Report Turkey (1997 and 2001) presents the Human Development Index (HDI) for Turkey, from 1965 to 1998, and for provinces and regions in Turkey for 1997. According to the Human Development Report (1997), some provinces in Turkey had the same level in terms of human development as European countries, on the other hand, the poorest localities showed a similar pattern as in African countries. It is stated in the HDR Turkey (1997) that unequal income distribution will never disappear unless inflation has decreased to a minimal level and education is given satisfactory importance. The share of education spending in Turkey's budget is relatively small compared to the other countries that share a similar development level. HDR (1997) concludes that economic growth and human development in Turkey have made a good progress during the last 40 years.

The State Planning Organization provides another report (2003), which tells the levels of socio-economic development in 2000 for Turkey's regions and provinces. According to this latest report, while the most developed provinces almost remain the same in the 1997-2003 period, they differ only in their rankings. This report takes more variables into account in computing provinces' socio-economic development index than does the HDI in the Human Development Report, even though the resulting index differs from the HDI, the rankings of provinces are notably similar.

This study investigates the income convergence of 10 of the most developed provinces and 10 of the moderately developed provinces, and 9 GAP provinces[3] within Turkey between the years 1975 and 2000. We examine the convergence pattern at the provincial level since because some provinces in Turkey are in the same geographical region but their development levels differ substantially. Since the second aim of this study is to draw a conclusion whether there was improvement in the GAP provinces' performance after the Southeastern Anatolia Project started in the 1970s, we pay special attention to provinces in the GAP region. The concept of economic development for a country or a province includes not only improvements in economic growth, but also improvements in other indicators such as life expectancy, education level, and health conditions. In this respect, we also pay attention to the education levels of the labor force in the cited provinces to give an idea about whether there appears to be advancement in their levels of education from 1975 to 2000.

The structure of the study is as follows. After literature review in Section 2, we give information about the development plans in Turkey and discuss the development gap between the most developed, developed, and GAP provinces in Section 3. Data and sample are presented in Section 4 before discussing the methodologies used in this study in Section 5. The analyses of σ (sigma) and β (beta) convergence are given in Sections 6 and 7 respectively. Section 8 concludes.

2. LITERATURE REVIEW

The issue of income disparities among countries or among regions of a country has attracted extensive attention of economists leading to studies on the existence of convergence in the income levels. Neoclassical Growth Models (NGM) claim that relatively poor regions or countries grow faster than their rich counterparts and over time they are expected to catch up with their rich counterparts.

The convergence concept was used to test the exogenous and endogenous growth models in the mid 1980s. While the presence of convergence in income levels of countries is taken as evidence to endogenous growth models, the reverse confirms NGM. The assumption in the Solow model of neoclassical growth of diminishing marginal returns to capital leads economies to achieve their steady states where the growth rates of per capita output, capital stock, and consumption are constant for a given rate of technological progress. Hence, the growth rate of per capita output will be equal to the exogenous rate of technological improvement. On the other hand, the absence of diminishing returns to capital in the production function results in sustainable growth rates over centuries when externalities such as an increasing quality of machinery or intermediate inputs are strong enough to offset the propensity to diminishing returns.[4]

In the literature, there are several convergence concepts out of which two of them (β and σ convergence) are commonly used. While the negative relationship between the growth rates and income levels of countries or regions has been designated as β convergence, the decrease in the standard deviation of income levels over time has been identified as σ convergence. As stated by Pack (1994), the standard test used in empirical studies for the β convergence is to regress the growth rates of GDP per capita on the initial level of per capita incomes of countries. A negative coefficient on the initial level of per capita income means that there is β convergence. The fact that countries or regions have different steady state levels calls for another aspect of β convergence, which is simply conditional convergence. A traditional way to express these different steady state levels of growth is to include some explanatory variables such as saving rates and human capital in the regression equation. If the resulting coefficient on the initial level of per capita income comes out with a negative sign we could conclude that there is β convergence, but in a conditional sense for the selected countries or regions.

Abramovitz (1986) opens with the catch-up hypothesis, which claims that countries being backward in terms of productivity levels have a potential for rapid advance. Two points are considered: First, if countries have adequate social capability[5] to adopt new technologies then differences among productivity levels of countries may create a strong potentiality for subsequent convergence levels. Second, he asserts that the institutional and human capital components of social capability only improve slowly as educational organization responds to the requirements of technological opportunity. Furthermore, it is asserted that some other conditions (the diffusion of knowledge, investment rate, and the mobility of resources) might play a role in the realization of the catch up process.

In the paper, a sample of 16 countries[6] and nine key years from 1870 to 1979 are used. Three measures considered are as follows: (1) Average productivity levels of the cited countries relative to that of the United States, (2) Relative variance around the means of relative productivity, and (3) Associations between initial levels of productivity and subsequent growth rates. The first measure is used to indicate whether the productivity levels of followers, as a group, tend to converge toward those of the leader, which was the leading country for most of the periods. The second estimates used in the paper give information on whether the countries with relatively low levels of productivity tended to grow faster than those having initially higher levels. Finally, with the third measure, it can be said that there may be some inverse correlation between initial levels of productivity and growth rates, if the technological backwardness is realized. He finds that:

> The variance among the productivity levels of the 15 "follower" countries declines drastically over the century –from a coefficient of variation of 0.5 in 1870 to 0.15 in 1979...In the same way, the inverse rank correlation between the initial productivity levels in 1870 and subsequent growth rates over increasingly long periods becomes stronger and stronger.[7]

He concludes that the growth rates of countries do not show a uniform character that a simple statement of the catch up hypothesis may suggest. Dramatic changes in productivity rankings occur and their causes are exogenous to the convergence process. Abramovitz also concludes that a country's capability to absorb technological advances that is not closely restricted on its existing level depends on it social history.

Baumol (1986) examines convergence phenomenon by focusing on two different data sets. In the first data set, he uses 16 countries[8] of the Maddison data set[9]. The regression of growth rates of the cited countries between the 1870-1979 period on the absolute level of GDP per work-hour in 1870 gives a high inverse correlation. His assertion is that the high inverse correlation may produce a spurious close relationship because the regression equation contains the same variable (y_0: initial GDP per work hour)[10] on both sides. In the second data set, he examines more countries for the 30-year period (1950-1980) than that of the Maddison countries. The sample consists of industrialized, centrally planned, and less developed countries. It is found that while 16 countries of the Maddison data set had a tight convergence that is not strong among the centrally planned economies. On the contrary, less developed countries show convergence neither among themselves nor with other groups. He explains the no convergence path appeared in the less developed countries with the lack of education and the associated skills necessary to adopt new and advanced technologies in industrialized countries.

Barro and Sala-i Martin (1992) use the NGM to study convergence across 48 U.S. states by exploiting two different data sets: The first data is based on personal income since 1840 and the second set on gross state product since 1963. If it is assumed that diminishing returns to capital (a broad view of capital) is adjusted slowly as economies developed, the estimated speed of convergence for the 1880-1988 interval is 0.0175, that is close to the rate the NGM asserts. The estimates of convergence rate are also provided for nine sub periods of the overall sample.[11] To hold the effects of the aggregate disturbances on state income constant, they construct a variable that takes into account the sectoral composition of each state's income. If the measures of sectoral composition are held constant, the speed of convergence appears to be around 0.02 per year for all of the time periods mentioned above. They also compare the results across U.S. states with those across countries for the 1960-1985 period. The main finding across countries is that the convergence parameter has the wrong sign which means that initially rich countries grow faster than their poor counterparts. If some other variables[12] are included in the regression equation, the estimated convergence rate comes up with the correct sign and it becomes 0.0184. They state that this convergence across 98 countries is a conditional one.

Mankiw, Romer, and Weil (1992) take the Solow model of growth (1956) and examine data for a large group of countries. The first group consists of all countries except the oil producers (Non-oil 98 countries); the second group of 75 countries (Intermediate) not including small countries, and finally the third group is made from 22 OECD countries. Their main findings are that the Solow model of growth accords with the international data and countries in their data set converge toward each other at the rate that the augmented Solow model expects.[13] The augmented Solow model they applied in the regressions predict that there is convergence in income per capita across countries with similar technology levels and population growth rates. They run cross-sectional regressions to compute both conditional and unconditional convergence rates. The unconditional convergence rates for the 1960-1985 period are -0.0036 for Non-oil, 0.0002 for Intermediate, 0.0167 for OECD countries. In the conditional convergence test, the regressions are run with and without the human capital variable. They draw the conclusion that including the human capital variable in the regression raises the rate of convergence (0.0137 for Non-oil, 0.0182 for Intermediate, and 0.0203 for OECD) for all groups of countries.

Islam (1995) uses a panel data framework to measure income convergence. The paper follows the framework of Mankiw, Romer, and Weil (1992) applying panel data techniques to the regressions for the same groups of countries in the 1960-1985 period. His single cross-sectional (without human capital variable) results are similar to those in Mankiw, Romer, and Weil (1992). In the pooled regressions, dividing the growth period into 5-year spans does not have any significant effect on the convergence rates. He states that the results from single cross-sectional are very similar to those from the pooled regressions. In the panel estimation, the level of technological progress is taken as the country specific individual term. In addition to the estimates from fixed effects panel estimation, the results of minimum distance (MD): Estimation with "Correlated Effects" is provided in the paper.

The studies about convergence in Turkey have a short story. The studies discussed below by Filiztekin (1998) and Güngör and Tansel (1998) examine the convergence pattern of all provinces in Turkey without paying attention to the development disparities of these provinces. Another study by Ateş, Erk, and Şanlı

(2000) that investigates regional income convergence in Turkey is also summarized below.

Filiztekin (1998) considers the convergence across industries and provinces in Turkey. His study evaluates whether the income levels of the regions in developing countries follow the same path as those in developed countries. He also examines how the steady states of Turkish provinces are determined and distributed. The cross sectional estimates of β convergence that follows Barro and Sala-i Martin's (1992) framework conclude that provinces of Turkey diverge yet at a low divergence rate (-0.0054). When regional dummies are included in the regressions, he finds that there is convergence but the estimates are not significant. With the inclusion of a variable that controls for sectoral composition of aggregate output, it is found that the magnitudes of the estimates of convergence parameter almost double.

The estimation of convergence with male and female education variables gives a negative coefficient on male education variable however the rate of convergence does not change at all. On the other hand, he argues that the fertility rate has a negative effect on the growth rates of Turkish provinces. Another variable included in the regressions is public investment. He concludes that although the coefficient on public investment is positive it may not be possible to claim that this positive effect is strong enough. Furthermore, the estimation of convergence parameter with regional dummies, structural variables, male and female education variables, fertility and public investment variable at a time gives a negative coefficient on public investment variable. All in all, he finds that the conditional convergence rate of Turkish provinces is about 1.9% per year.

In addition to the cross-sectional regressions, σ convergence is examined in the paper. It is concluded that the dispersion of output levels have been increasing since the late 1970s, which means that provinces in Turkey are not converging toward each other. Moreover, by the examination of sectoral productivity levels[14] and growth rates, Filiztekin (1998) claims that most of the sectors in Turkey converge except agriculture and services.

Güngör and Tansel (1998) consider the convergence in productivity levels of provinces in Turkey. They also compute the convergence rate of Eastern and Western provinces in Turkey. Contrary to Filiztekin's (1997) findings, they find that there is absolute convergence in the productivity levels of Turkish provinces. While the convergence rate is about 0.2% per year for the 1975-1995 period, it is roughly 0.5% per year for the 1980-1995 liberalization period. In the examination of conditional convergence, they include the human capital variable that causes a higher convergence rate among Turkish provinces. They conclude by analyzing σ convergence among Turkish provinces that the dispersion of productivity levels seems to increase from 1975 to 1980; it starts decreasing after the 1980s.

Ateş, Erk, and Şanlı (2000) study whether there seems to be statistically significant convergence among regions of Turkey for the 1979-1997 period. They adopt the frameworks in Barro (1991) and Barro and Sala-i Martin (1992). However, instead of estimation results, they use the figures that represent the average growth rates of regions vs. log of real per capita incomes in 1979 to explain convergence path of the regions in Turkey. They claim that there is a bell-shaped relationship between per capita income distribution and economic growth among regions in Turkey. When they look at the β convergence in income levels of more homogenous provinces, it is stated that the bell-shaped relationship becomes flatter. By calculating relative incomes of six regions of Turkey to the Marmara region, they draw the conclusion that there is divergence among overall regions yet a convergence among low per capita income regions. They also state that the growth process can only be accelerated when the physical capital investments are complemented with investments on human capital. Although this study considers the regional convergence in Turkey, the argument on it does not account for different development levels of provinces in the same region.

3. AN OVERVIEW OF THE DEVELOPMENT GAP BETWEEN THE MOST DEVELOPED, DEVELOPED AND GAP PROVINCES

Less developed countries treated development projects as an investment project before 1960. They thought that they could revive their economies by physical investments and hence increase their productivity in whole country. As a result of a production increase, significant improvements of living standards in all of the regions of that country could be seen.

The development projects based on this approach helped less developed countries enhance their production levels. While the modernization of agriculture made agriculture spread in country, the use of modern input such as irrigation and fertilizers increased the productivity level.

However these projects did not take into account the socio-economic and cultural structure of the societies they aimed. Since early development projects did not attach importance to the participation of the society, they did not help less developed countries, but rather gave a rise to their social problems. Such an approach not only deepened the regional disparities in those countries but also made the regions that were advantageous at the beginning of projects richer in comparison to the regions with poor resources such as dry soil and an unskilled labor force.

In this respect, the development project attempts in Turkey summarized below may give intuition about how the development concept has improved since the early 1960s.

3.1. DEVELOPMENT PLANS IN TURKEY

The social and economic development of Turkey has been administered by 5-Year Development Plans since the beginning of the 1960s. The First 5–Year

Development Plan, put into practice in 1963, was the beginning of the planned economy period. According to this first plan balanced development among regions should be taken into consideration and the investment projects aiming to improve conditions in underdeveloped places in Turkey should be given priority. Later development plans repeat the statement above and the main target is the rapid and balanced development among social groups and regions.[15]

Industrialization was regarded as the most important part of the development plans; the governments undertook the industrial investments in Fifth and Sixth 5-Year Development Plans. The Seventh Plan stated that the government must make the investment projects regarding social welfare to create employment and to initiate development.

However, Mutlu (2000) claims:

> Interregions balanced development contradicts with the rapid development because development refers to industrialization in our era. Economic rationality requires industries except those involving raw materials to be established in the Western part of the country close to provinces having import and export centers and having relatively better infrastructure, market and population.[16]

On the other hand, the first regional study was realized in the vicinity of Köyceğiz-Dalaman in 1957 within an OECD program.

> The aim was to search for and to put into practice the most appropriate development methods and to make use of them for other similar regions. The second regional plan is the Marmara Region Project. This project was planned to remedy the irregular urbanization created by İstanbul's rapid growth and to protect its historical environment damaged by unplanned constructions.[17]

3.2. THE SOUTHEASTERN ANATOLIA PROJECT (GAP)

The most extensive project was GAP "The Southeastern Anatolia Project" in the planned economic period. The main target of this project defined at the official web site of GAP is to remove interregional development disparities by increasing households' income levels and living standards, and also aims to contribute to the national development targets, such as social stability and economic growth, by enhancing productivity and employment opportunities in rural areas. The project area covers the Euphrates (Fırat) and the Tigris (Dicle) river basins and 9 provinces located in upper Mesopotamian plains.

The idea of the utilization of irrigation and energy potential of the Euphrates and the Tigris rivers led to the construction of dams and energy centrals in the 1970s. Although GAP was planned as an irrigation and hydroelectric project in the 1970s, it was transformed to the multi-sector, socio-economic regional development program in the 1980s. GAP has been designated as a "sustainable human development project" since the mid-1990s. Irrigation, hydraulic energy, agriculture, rural and urban infrastructure, forestry, education and health sectors are included in the development program.

> The first idea and decision to utilize the waters of Euphrates and Tigris rivers rationally belong to Atatürk, the founder of the Republic. In those years when the country was making great efforts for change and modernizations in all fields including material and spiritual, the need for electrical energy came to the fore as an urgent and priority issue. Then, upon the order of Atatürk, the Electricity Studies Administration was founded in 1936 to investigate issues on how rivers in the country could be utilized for energy production. The Administration began its detailed studies with the "Keban Project" and established observation stations to assess the flow and other characteristics of the Euphrates.[18]

The development plans for the Southeastern Anatolia region had not been realized until the 1960s because of the World War II. General Directorate of State Hydraulic Works (DSİ), established in 1954, worked on 26 different water basins in Turkey. These studies were followed by the "Euphrates Basin Development Report" in 1961 that summarizes the irrigation and energy potential of the Euphrates and by the "Lower Euphrates Development Report" in 1966. There were also some similar studies for the Tigris basin prepared by The Diyarbakir Regional Directorate of DSİ.

While the studies mentioned above gave an idea about the utilization of the Euphrates and the Tigris basins, the projects on these two river basins took the name of South Eastern Anatolia Project in 1977. Afterwards, SPO undertook the development aspect of this project in 1986. With the completion of the GAP Master Plan in 1989, GAP was transformed into multi-sector integrated regional development project. The main goal of this plan is to increase the development level of the region to that of the country and to transform the region into an export center based on agricultural goods. However, since GAP Master Plan did not pay enough attention to concepts such as social sphere and sustainable human development, GAP Region Development Plan was prepared in a different understanding based on new development concepts accepted in the international arena. With this human development approach, it is expected to catch up with human development targets, to enhance people's participation, and to make use of public resources and potential rationally.

3.3. DEVELOPMENT INDICATORS FOR THE CITED PROVINCES

After giving some information about the time elapsing after the establishment of GAP to today, now we turn our attention to the socio-economic structure of the provinces in Southeastern Anatolia and to that of overall region. It ranks sixth among Turkey's seven regions in regard to its socio-economic development index by SPO (2003). Southeastern Anatolia consisting of 9 provinces[19] has a population of almost 6.6 million, which makes it the sixth largest among other regions of Turkey. There are only three provinces whose population exceeds one million. While

Şanlıurfa leads them with its population of 1,443,422, Diyarbakır and Gaziantep follow with their populations of 1,362,708 and 1,285,249, respectively.

The population growth in Southeastern Anatolia was 2.48% on the average during the 1990-2000 period and this made it the second highest in Turkey after Marmara Region. The fertility rate and average household size of the region are 4.86 and 6.55, respectively. The region, having the biggest fertility rate and average household size in Turkey, has a low literacy rate, which is about 73%. The literacy rate for the women in Southeastern Anatolia is 60.16%. Moreover, the schooling ratio in primary education and high school indicates importantly the backwardness of the region.

The employment indicators of the region are also very striking. Whereas the ratio of paid workers to total labor force is about 33%, the same ratio for women in the region is no more than 4%. While the important part of labor force (61.35%) is employed in agriculture sector, the share of labor force in industry is only 7% in the region.

The most industrialized province in Southeastern Anatolia is Gaziantep. The region ranks as fourth in industry sector but the crucial part of this sector is located in Gaziantep. The only province whose socio-economic development index and human development index exceeding that of the Southeastern Anatolia region is Gaziantep.

GDP per capita being an important indicator of the development of an economic unit follows a similar path as the other indicators mentioned above. The share of Southeastern Anatolia in Turkey's GDP is 5% and with this rate the region, again, ranks sixth. Moreover, per capita public investment during 1995-2000 in the region does not change its ranking among Turkey's regions.[20]

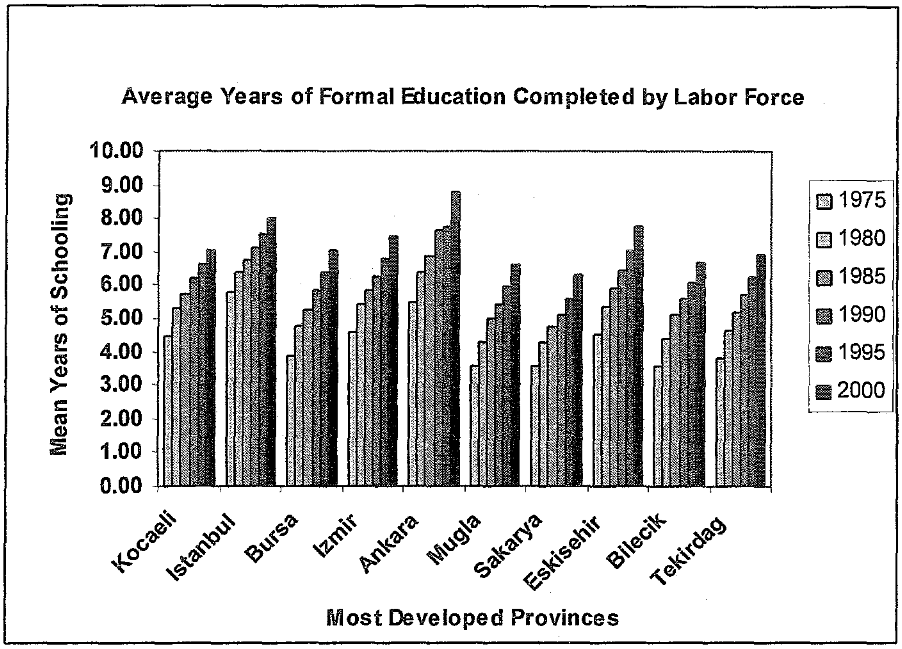
Since the welfare of the region based on either the human development index by HDR (2001) or on the socio-economic development index by SPO falls very behind the other regions of Turkey except Eastern Anatolia. Immigration, particularly of the skilled and educated people and flight of capital to the other regions of the country are other impediments to the development of region.

According to regional HDI (1997), the most developed regions are the Aegean and the Marmara regions with an HDI of 0.801 and 0.757 respectively; the least ones are the Eastern and the Southeastern Anatolia regions with an HDI of 0.612. HDI of Turkey is 0.720 and this shows that the Eastern and the Southeastern Anatolia regions lag behind other regions. The Central Anatolia, the Mediterranean, and the Black Sea regions follow the Marmara-Aegean regions with HDI's of 0.736, 0.713, and 0.694, respectively.

At the provincial level, while some of the most developed provinces are Ankara, İstanbul, Eskişehir, İzmir and Kocaeli, the least developed ones, comes from the Eastern and Southeastern Anatolian regions. Almost all provinces in the GAP region are at the very bottom of the Table I in Appendix I except Gaziantep. While Gaziantep takes the lead with an HDI of 0.699, Diyarbakır ranks second with 0.621, Adıyaman, Batman, Mardin, Şanlıurfa, Siirt, and Şırnak follow them, respectively. The figure presented above is an example of the disparities between provinces at the same geographical region. Although Central Anatolia ranks third among other regions, the province of Ankara in this region is one of the most developed provinces in Turkey. On the other hand, the Southeastern Anatolia region is the second least developed one, Gaziantep province in this region has intermediate human development level.

Table I in Appendix II shows the mean years of schooling[21] of the labor force in the most developed, developed and GAP provinces. In 1975, GAP provinces have the lowest mean years of schooling compared to the most developed and developed provinces as in the HDI index. Even if the average years of schooling for GAP provinces increased, the same backwardness in education can also be seen in 2000 except Gaziantep province. While Figures I and II represent the mean years of schooling of the provinces included in the most developed and developed provinces respectively, Figure III shows GAP provinces.

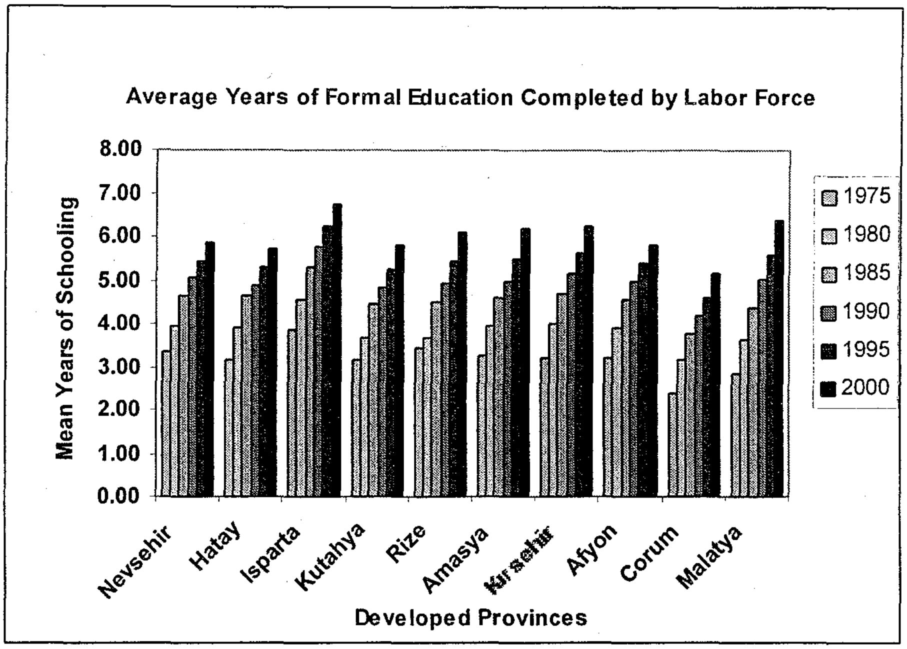
Figure I



As can be seen from Figure I, there is a continuous increase in the mean years of schooling over the 1975-2000 period. For most of the time, the educational attainments of the labor force expressed by the mean years of schooling are above that of Turkey. In 1975, İstanbul had the highest level of educational attainment among the most developed provinces, after 1985 Ankara was the leader of other provinces. However, the most developed provinces except Ankara and Istanbul do not reach to the level of compulsory education, which was increased from 5 to 8 years in 1997.

The steady increase in the mean years of schooling can also be seen from Figure II for the developed provinces of Turkey. However, the common fact over the years

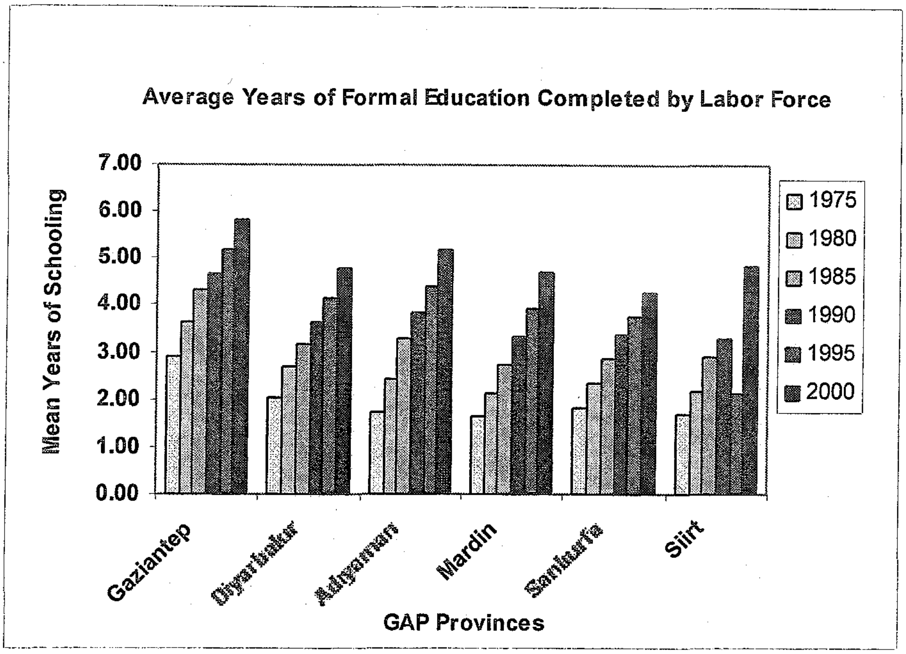
Figure II



between 1975 and 2000 is that these values are either roughly equal to or a little bit less than those of Turkey for all provinces. Another striking fact is also that the educational attainments of the labor force in the developed provinces are no more than that of the labor force in the most developed provinces almost for all years. While Isparta is the leader of the group in terms of mean years of schooling, the province of Çorum takes place at the very bottom of other provinces.

In Figure III, the educational attainments of the labor force in GAP provinces are presented. As in the other groups of provinces, the mean years of schooling improves over time and it takes the highest level in 2000 for all provinces. It can be seen from the figure that, the province of Gaziantep has the highest level of educational attainment for all years yet the provinces of Mardin and Siirt and Şanlıurfa having the least lag behind other provinces and Turkey's average. In 2000, the mean years of schooling for Şanlıurfa, Mardin, Siirt are 4.27, 4.70, and 4.85 respectively. The highest level of educational attainment is 5.85 for Gaziantep for the same year.

Figure III



The figures above point out three facts: (1) There is a steady increase in the mean years of schooling for all gorups of provinces over the 1975-2000 period. (2) The province or provinces having the highest educational attainment in 1975 have again the highest level at the end of period, in 2000, e.g. Istanbul and Ankara for the most developed, Isparta for the developed, and Gaziantep for GAP provinces. (3) The gap in terms of education levels approximated by the mean years of schooling among the groups continue over the period, even though there is an improvement in the education levels of the labor force in GAP provinces they lag behind at the end of period as at beginning of the period.

4. DATA AND SAMPLE

We prefer using provincial data in examining regional disparities due to the fact that the provinces of Turkey show great differences even if they are included in the same geographical region. In this sense, we divide provinces into three groups: Most developed provinces, developed provinces and GAP provinces. While determining the most developed and developed provinces, as stated before, we made our decision based on Human Development Index (HDI). This index was given to us in Human Development Report Turkey (2001), which was prepared for UNDP[22] for Turkey's provinces.

The Human Development Report Turkey (1997 and 2001) presents the Human Development Index (HDI) for Turkey overtime (from 1965 to 1998) and for provinces and regions in Turkey for 1997. Although HDR Turkey (2001) again computes the HDI for the 1997, there are some difference in computation of index and variables used in the reports in 1997 and 2001. Whereas the former report uses average life expectancy, literacy and schooling enrollment rates for education, income for 1997 in calculation of HDI, the later takes into account life expectancy at birth, adult literacy rate, total schooling rate and real GDP per capita for the same year. HDI takes a value between 0 and 1. While the countries or provinces assigned to an HDI value greater than 0.800 are said to have high human development, and provinces whose HDI values are between 0.500 and 0.799 intermediate human development, the others low human development. Because of differences in HDI in the two reports, there are some changes in the rankings of provinces in Turkey.[23]

Our data includes ten provinces from the most developed and developed groups of provinces based on HDI (1997) in HDR (2001) to compare with GAP provinces, Gaziantep, Diyarbakır, Adıyaman, Şanlıurfa, Mardin, Siirt, Şırnak and Kilis. Since

Şırnak, Batman, and Kilis are newly created provinces from Siirt and Gaziantep respectively, in our regressions we take Gaziantep and Kilis together and Siirt, Batman, and Şırnak as well.[24] According to HDI, whereas the most developed provinces, in a descending order, are Kocaeli, Istanbul, Bursa, İzmir, Ankara, Muğla, Sakarya, Bilecik, Tekirdağ, developed ones are Nevşehir, Kırıkkale, Hatay, Isparta, Kütahya, Rize, Amasya, Kırşehir, Afyon, Çorum, and Malatya.

The most important data is GDP values at the provincial level. We use GDP data between 1975-2000 and the data is based on 1987-constant prices. While GDP values between 1975-1986 were obtained from Özötün (1980 and 1988), values dating from 1987 to 2000 were taken from SIS[25]. We used the growth rates of GDP of provinces to find a constant price GDP series between 1975 and 1986.[26] On the other hand, another important variable in our analysis is the human capital variable. The most important determinants of human capital are the knowledge and skills of the population, which are obtained by either formal or informal education (such as learning by doing and on-the-job training). Of course, the effects of general health of the population on human capital cannot be denied. As the population becomes aware of health and nutrition issues, it is clear that human capital in the economy will increase to a desired level. However, a human capital index that includes these issues cannot be obtained easily. Due to lack of data on informal education, economists generally take the formal education part of human capital into account.

In the literature, although there are several measures in computing the human capital variable, enrollment ratios, literacy rates and the average years of education are commonly used. The labor force completing different levels of formal education have inevitably different skills, which constitute a significant part of human capital variable. Yet, Sala-i Martin and Mulligan (1995) mention two disadvantages of using this measure as a human capital stock. The first disadvantage is those workers completing different levels of schooling are perfect substitutes in the labor market and the second one is that workers having the same level of education acquire also the same amount of skills.

In this study, human capital stock is the average years of formal education acquired by labor force; since it is a stock measure and it gives us information about the higher levels of educational attainment of the labor force. The data is obtained from the General Population Censuses (GPC) conducted by SIS. The Censuses provide us with information about the level of formal education labor force completed but it excludes the number of years of formal education non-graduates received at each level is omitted. Therefore, Tansel and Güngör (1997) state:

> The measured 'average years of formal education completed by the labor force' variable may underestimate the stock of human capital if the partially completed levels of schooling have value in terms of augmenting the stock of human capital.[27]

The average years of formal education is given by the following formula in Psacharopolous and Arriagada (1986),

$$\text{Average Years of Schooling} = \sum_i YE_i LF_i \qquad (1)$$

where i denotes the level of schooling, YE_i is the number of years of schooling matching to each level, and LF_i is the portion of the labor force that completed the level of schooling denoted by *i*.

While the mean years of schooling data for the years between 1975 and 1990 was taken from Tansel and Güngör (1997), it was computed by the author herself for the years 1995 and 2000. Table I includes the same numbers for the years of completed formal education as in Tansel and Güngör (1997) used in the calculation of the mean years of schooling.

Whereas they approximate 'No formal education' as the number of illiterate persons in the labor force, they assume those having some formal education

Table I

Schooling Levels and the Number of

Years of Completed Formal Education

Associated with Each Level

i =level of schooling	YE_i
No formal education	0
Some formal education	2
Primary school	5
Junior high school	8
High school	11
Higher Education	15

completed, on average, the first two years of primary school. They take the number of persons in this category from the 'Literate without diploma' in the GPC classification.

GPC in 2000 divides labor force into following parts: Illiterate, No school completed, Primary school, Primary education, Junior High school or Vocational school at Junior High school level, High school or Vocational High school at High school level, and finally Higher education. Since Turkey had adopted 8-year primary education before the 2000 census, to be consistent with previous data the author adds up the numbers of persons completing Primary education to the number of those completing Junior High school. On the other hand, those who are in the group of No school completed in 2000 GPC approximate the number of persons in the no formal education category.

Other data used in this study are labor force growth and saving rates of the cited provinces. We obtain the number of people in the labor force for the 1975-1990 period from Güngör and Tansel (1997) and that for the year 2000 from GPC 2000 provided by DIE. Since in 1995, there was no population census in Turkey, the labor force figure of provinces for this year is projected by the author itself. While computing the labor force growth for 5-year period between 1975 and 2000 and for the entire period we used the following formula:

$$r=[ln(P_t/P_0)]/t \qquad (2)$$

where r denotes the growth rate, P_t the labor force at time t, *and* P_0 the labor force at the initial year. The estimate of labor force for 1995 made by using the rate of growth, r, to project from 1990 is as follows:

$$P_{1995}=P_{1990} \cdot e^{rt} \qquad (3)$$

where t= 1995-1990. Since the sum of labor force figures for each province is not equal to the national labor force, the initial estimates for the year 1995 are adjusted by proportional scaling to be consistent with the national labor force figures.[28]

The most difficult data to obtain is the saving rates of the provinces. Public investment figures for each province could be used as a proxy for the saving rate yet it is widely known that they account for small part of the overall investment which includes both private and public investment. Since the majority of the investment projects starting in a year, in general, may not be completed in that year, this may be overestimating the actual figure for the cited provinces. The other difficulty in using investment figures, as stated by Güngör and Tansel (1997), even though national investment can be taken as an indicator of national saving, it is more questionable to make the same assumption for provinces or regions of a country. For these reasons we used the average industrial share of the provinces in their total GDP. However, the fact that the average industrial share of the provinces over the cited time period does not take into account the investment occurring in non-industrial sectors such as agriculture and services brings about another difficulty in using these figures as an approximation of the saving rates.

5. METHODOLOGY

In the literature, there are mainly two definitions of convergence: σ convergence and β convergence. Barro and Sala-i Martin (1995) and Sala-i Martin (1996) give formal definitions of σ and β convergence. Sala-i Martin (1996) states that there is σ convergence if the dispersion of real per capita income across set of economies decreases over time. Sala-i Matin (1996) defines β convergence as the regression of the growth rate of per capita income on the starting or initial level of per capita income. He also states that if a negative relation between these two is found, there is β convergence across economies. It is also mentioned in the same paper that although these two convergence concepts are considered similar, in fact they are different:

> σ convergence studies how the distribution of income evolves over time and β convergence studies the mobility of income within the same distribution.[29]

Moreover, Sala-i Martin (1996) proves that β convergence is a necessary but not a sufficient condition for σ convergence.

In the literature, conditional β convergence differs from absolute β convergence. Mankiw, Romer, and Weil (1992) states that the convergence predicted in the Solow model is a conditional one since it predicts convergence after accounting for determinants of steady state level of per capita income such as population growth and physical and human capital accumulation.

The σ convergence, in this research, is tested by using sample standard deviation of the per labor force GDP levels of the most developed, developed ten provinces and GAP provinces. If the sample's standard deviation decreases over time, this will demonstrate the existence of σ convergence within cited provinces.

For β convergence, Barro and Sala-i Martin (1992), Mankiw, Romer, and Weil (1992) and Islam (1995) framework are used while examining convergence path of the cited provinces in Section 4.

The first methodology we use is that of Barro and Sala-i Martin (1992). They use the following equation to estimate convergence parameter, β over the time interval between time t_0 and t_0+T. The average growth rate of per capita income or product for economy i is given by

$$\frac{1}{T}\cdot\log\left[\frac{y_{i,t_0+T}}{y_{i,t_0}}\right] = a - \frac{1-e^{-\beta\cdot T}}{T}\cdot\log(y_{i,t_0}) + u_{i,t_0,t_0+T} \tag{1}$$

where a is the same across economic units and u_{i,t_0,t_0+T} is the disturbance term. The constant term, a, includes the steady state level of per capita income which is assumed to be the same across economic units and that of technology. Dummy variables that are held constant are used to account for regional differences.

The second methodology for income convergence concept used in this study is introduced by Mankiw, Romer and Weil (1992). Their model is based on the Solow model (1956). The model assumes constant returns to scale production function with two inputs, labor and capital, and exogenous technological progress. In addition to differences in saving and population growth rates in a group of economic units in the Solow model, they consider differences in human capital, which is calculated by secondary level enrollment rate.

The labor augmented production function at time t is given by

$$Y(t) = K(t)^{\alpha}(A(t)L(t))^{1-\alpha} \qquad 0<\alpha<1 \tag{2}$$

where $Y(t)$ is the output, $K(t)$ capital, $L(t)$ labor, and $A(t)$ the level of technology at time t. Labor and technology grow exogenously at rates n and g respectively, and are given by

$$L(t) = L(0)e^{nt} \tag{3}$$

$$A(t) = A(0)e^{gt} \tag{4}$$

where *L(0)* and *A(0)* are the initial levels of labor and technology.

The evolution of the stock of capital per effective unit of labor, $k = \frac{K}{AL}$, is defined by

$$\dot{k}(t) = sy(t) - (n+g+\delta)k(t) \tag{5}$$

where δ is the depreciation rate and s is the fraction of income invested in physical capital. At the steady level of k, equation (5) becomes

$$k^* = \left[\frac{s}{n+g+\delta}\right]^{\frac{1}{1-\alpha}} \tag{6}$$

After substituting (6) into production function and taking logs the steady state income is obtained as follows:

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln A(0) + gt + \frac{\alpha}{1-\alpha}\ln(s) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) \tag{7}$$

The important assumption of the model is that the growth rate of technology, *g*, and depreciation rate, δ , are constant across economic units. However, the term A(0) that depends on technology, resource endowments, and geographical properties behaves differently in different economies and it is given in the following way:

$$\ln A(0) = c + \varepsilon$$

where c is a constant and ε is a country specific disturbance term. Equation (7) can be rewritten as

$$\ln\left[\frac{Y(t)}{L(t)}\right] = c + \frac{\alpha}{1-\alpha}\ln(s) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) + \varepsilon \tag{8}$$

With the addition of the human capital into the Cobb-Douglas production function in equation (1), they define the augmented Solow model as follows:

$$Y(t) = K(t)^{\alpha} H(t)^{\varphi} (A(t)L(t))^{1-\alpha-\varphi} \tag{9}$$

where H is the stock of human capital and the other variables are the same as in the Solow model described above. The evolution of physical and human capital are written by

$$\dot{k}(t) = s_k y(t) - (n+g+\delta)k(t) \tag{10}$$

$$\dot{h}(t) = s_h y(t) - (n+g+\delta)h(t) \tag{11}$$

where y(t), k(t), and h(t) are output, physical and human capital per effective unit of labor at time t, and s_k and s_h are the fractions of income invested in physical and human capital, respectively.

The assumption $\alpha + \varphi < 1$ results in decreasing returns to the two types of capital. The steady state values of k and h from (10) and (11) is determined by

$$k^* = \left(\frac{{s_k}^{1-\varphi} {s_h}^{\varphi}}{n+g+\delta} \right)^{\frac{1}{1-\alpha-\varphi}} \tag{12}$$

$$h^* = \left(\frac{{s_k}^{\alpha} {s_h}^{1-\alpha}}{n+g+\delta} \right)^{\frac{1}{1-\alpha-\varphi}} \tag{13}$$

As before, after substituting (12) and (13) into the production function and taking logs, the steady state level of income is given by

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln A(0) + gt + \frac{\alpha}{1-\alpha-\varphi}\ln(s_k) + \frac{\varphi}{1-\alpha-\varphi}\ln(s_h) - \frac{\alpha+\varphi}{1-\alpha-\varphi}\ln(n+g+\delta) \tag{14}$$

This equation relates per capita income to the population growth and the physical and human capital accumulation.

The combination of equation (13) with (14) defines the per capita income as a function of s_k, n, and h^* in the following equation

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln A(0) + gt + \frac{\alpha}{1-\alpha}\ln(s_k) + \frac{\varphi}{1-\alpha}\ln(h^*) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) \tag{15}$$

Equation (15) is very similar to (7). One of the main important findings of Mankiw et al. (1992) is that the human capital variable is an omitted variable in (7), which biases the coefficients on saving and population growth.

The third methodology used in this paper to estimate convergence parameter comes from Islam (1995). Even though Islam (1995) follows Mankiw, Romer, and Weil framework, while estimating convergence parameter, instead of cross sectional data he uses panel data.

As stated by Islam (1995), in equation (8), Mankiw, Romer, and Weil make the assumption that ε is independent of the regressors, saving (s) and population growth rate (n). The assumption above is necessary for OLS estimation to be consistent and valid in the framework of a single cross-section regression. However, Islam (1995) states that the country-specific technology shift term ε may not be uncorrelated with the saving and population growth rate in that country. This possibility requires an instrumental variable estimation instead of OLS estimation to obtain consistent estimators. Yet, the fact that it might be rather problematical to find instrumental variables, which will be highly correlated with the explanatory variables of the model but uncorrelated with the term lnA(0) makes the instrumental variable estimation ineligible.

At this stage, Islam (1995) assumes that the panel data framework gives the opportunity to control technology shift term ε in a better way. He starts with writing the rate of convergence as described in the literature. Letting y(t) denote the actual level of income per effective labor at time t and y^* its steady state level, the rate of convergence is obtained from

$$\frac{d \ln y(t)}{dt} = \beta [\ln(y^*) - \ln y(t)] \tag{16}$$

where $\beta = (n + g + \delta)(1 - \alpha - \varphi)$. This equation can be written as

$$\ln y(t_1) = (1 - e^{-\beta . t}) \ln y^* + e^{-\beta . t} \ln y(t_0) \tag{17}$$

where $y(t_0)$ and $y(t_1)$ are per effective incomes at time t_0 and t_1, respectively and $t=t_1-t_0$.

Substituting y^* and $y(t)$ where

$$y(t) = \frac{Y(t)}{A(t)L(t)} = \frac{Y(t)}{L(t)A(0)e^{gt}}$$

so that

$\ln y(t) = \ln\left(\frac{Y(t)}{L(t)}\right) - \ln A(0) - gt = \ln \hat{y}(t) - \ln A(0) - gt$ into the equation (17)

gives

$$\begin{aligned} &\ln \hat{y}(t_1) = (1 - e^{-\beta . t}) \ln A(0) + g(t_1 - e^{-\beta . t} t_0) + e^{-\beta . t} \ln \hat{y}(t_0) + \\ &(1 - e^{-\beta . t}) \frac{\alpha}{1-\alpha} \ln(s) - (1 - e^{-\beta . t}) \frac{\alpha}{1-\alpha} \ln(n + g + \delta) \end{aligned} \tag{18}$$

for the usual Solow model and

$$\begin{aligned} &\ln \hat{y}(t_1) = (1 - e^{-\beta . t}) \ln A(0) + g(t_1 - e^{-\beta . t} t_0) + e^{-\beta . t} \ln \hat{y}(t_0) + \\ &(1 - e^{-\beta . t}) \frac{\alpha}{1-\alpha} \ln(s_k) + (1 - e^{-\beta . t}) \frac{\varphi}{1-\alpha} \ln(h^*) - (1 - e^{-\beta . t}) \frac{\alpha}{1-\alpha} \ln(n + g + \delta) \end{aligned} \tag{19}$$

for the human capital augmented Solow model. The restricted form of equation (19) is given by

$$\begin{aligned} &\ln \hat{y}(t_1) = (1 - e^{-\beta . t}) \ln A(0) + g(t_1 - e^{-\beta . t} t_0) + e^{-\beta . t} \ln \hat{y}(t_0) + \\ &(1 - e^{-\beta . t}) \frac{\alpha}{1-\alpha} [\ln(s_k) - \ln(n + g + \delta)] + (1 - e^{-\beta . t}) \frac{\varphi}{1-\alpha} \ln(h^*) \end{aligned} \tag{20}.$$

Islam (1995) states that equation (19) is a dynamic panel data model with $(1 - e^{-\beta . t}) \ln A(0)$ as individual country-effect term that is invariant to time. The usual panel data notation for this equation is as follows:

$$y_{it} = \gamma . y_{i,t-1} + \beta_1 x_{it}^1 + \beta_2 x_{it}^2 + \beta_3 x_{it}^3 + \eta_t + \mu_i + \upsilon_{it} \tag{21}$$

where

$$y_{it} = \ln y(t_1)$$

$$y_{i,t-1} = \ln y(t_0)$$

$$\gamma = e^{-\beta.t}$$

$$\beta_1 = (1 - e^{-\beta.t})\frac{\alpha}{1-\alpha}$$

$$\beta_2 = -(1 - e^{-\beta.t})\frac{\alpha}{1-\alpha}$$

$$\beta_3 = (1 - e^{-\beta.t})\frac{\varphi}{1-\alpha}$$

$$x_{it}^1 = \ln(s_k)$$

$$x_{it}^2 = \ln(n + g + \delta)$$

$$x_{it}^3 = \ln(h^*)$$

$$\mu_i = (1 - e^{-\beta.t})\ln A(0)$$

$$\eta_t = g(t_1 - e^{-\beta.t} t_0)$$

and transitory error term, υ_{it}, differs across countries and time periods and has zero mean. In his article, the single cross-section over the entire period is divided into the shorter periods to obtain the panel data formulation in equation (20).

As stated in Islam (1995), the panel data estimation requires the question whether the country specific terms are fixed or random to be answered. He states that the Least Squares with Dummy Variables (LSDV) is consistent when $T \to \infty$ relying on Amemiya (1967) that shows that LSDV is consistent and asymptotically equivalent to the Maximum Likelihood Estimators (MLE).

6. ESTIMATION RESULTS

6.1. SINGLE CROSS-SECTIONAL REGRESSION RESULTS

As stated in Section 5, three different methodologies of convergence by Barro and Sala-i Martin (1992), Mankiw, Romer, and Weil (1992), and Islam (1995) are examined in this paper. While the first two of them are based on single cross section estimation, the methodology Islam (1995) follows requires panel estimation over the relevant economic units and time interval.

The sample in this study consists of 26 provinces of Turkey over the time span 1975-2000[30]. In addition to the entire period estimation results, the results for five-year periods over the same time interval, 1980-2000 and 1990-2000 periods are given in Table I, Table II, and Table III in Appendix III in order to examine cross sectional convergence pattern of the selected provinces.

The complete regression results for Barro and Sala-i (1992) framework are given in Table I in Appendix III and they include Ordinary Least Squares (OLS) and Nonlinear Least Squares (NLS) with and without regional dummy variables.

The coefficient on initial income in equation (1) is $-\frac{1-e^{-\beta \cdot T}}{T}$ and its magnitude depends on the length of the time interval, *T*, for a given β . As stated by Barro and Sala-i Martin (1992), as T gets larger the coefficient approaches to 0. In this respect, the estimation of β using nonlinear least squares gives similar estimates irrespective of the length of time interval as it takes into account the associated T value. Moreover, as can be seen from Table IV, the implied and direct estimates of β obtained from OLS and NLS estimations are the same when the associated T value is considered in OLS estimations.

In Table I in Appendix III, although each regression contains a constant and the regressions with the regional dummy variables include both a constant and two regional dummies for developed and GAP provinces, the estimated coefficients for the constant and regional dummies are not given in Table I in order to save space and avoid confusion with too many estimated coefficients.

The first column of Table I presents the relevant time span of the regressions. The estimates of convergence parameter are given for the entire period 1975-2000 and five-year sub periods. The results for the period 1980-2000 and 1990-2000 are also given to compare liberalization period in Turkey's economy starting in 1980 with the entire period and to evaluate the effects of the Southeastern Anatolia Project identified as an integrated development project in the 1990s on the convergence speed for these periods.

A positive β implies that poor provinces tend to grow unconditionally faster than rich ones if the term, a, in equation (1) in Section 5 which includes the steady state levels of income and technology levels of provinces in the sample is assumed to be the same across provinces.

Although NLS estimates are insignificant for all periods at 0.05 significance level except the 1990-2000 period, estimates for the periods 1985-1990, 1995-2000, and 1980-2000 are significant at 0.1 significance level. There is a negative rate of convergence for the 1975-1980 and 1980-1985 periods but these estimates are insignificant either at 0.05 or 0.1 significance level. While the convergence speed is 0.04 for 1985-1990, 0.02 for 1995-2000, it is around 0.01 for the liberalization period. The estimates of convergence rate increases to 0.02 per year for the period 1990-2000. This shows that GDP per labor force of the sample consisting of most developed, developed and GAP provinces of Turkey is found to be converging at a rate of about 0.009 per year, 0.01 per year, and 0.017 for the 1975-2000, 1980-2000, and 1990-2000 periods respectively. When we include regional dummies in the regressions to account for differences in the steady state levels of GDP of provinces, NLS estimates become significant for all periods except 1980-1985 and 1985-1990 periods. While the estimates of convergence rate, β , are higher in sub periods than in the 1975-2000 and 1980-2000 periods, the highest rate of convergence, 0.06 per year, is in the period 1995-2000. The rate of convergence is about 0.04 per year for the longer periods 1975-2000 and 1980-2000 and 0.06 per year for the 1990-2000 period. This rate is greater than the estimated convergence parameter without regional dummies for the same periods. As can be seen from Table I in Appendix III, the inclusion of regional dummy variables into the regressions raises the convergence speed of provinces in the sample for the periods in which the estimates are significant at either the 0.05 or the 0.10 levels.

OLS estimates with and without regional dummies are also given in the third and fourth columns of Table I in Appendix III. As stated before, the implied estimates of convergence parameter from OLS estimation are the same as the NLS estimates for all periods however the associated t-ratios of estimates differs from that of NLS estimates. The estimates for the 1985-1990, 1995-2000, and 1980-2000 are 0.04, 0.02 and 0.01 per year respectively. OLS estimates with regional dummies are significant for all periods except the 1980-1985 period and higher than those without regional dummies. While the highest convergence rate, 0.07 per year is found for the 1985-1990 sub period, the lowest one, and 0.04 per year for the 1975-1980 sub period. The convergence speeds with regional dummies for the longest and the 1980-2000 periods are roughly the same and are around 0,04 per year for both periods yet it is greater in the 1990-2000 period. The main result obtained from Barro and Sala-i Martin framework is that the addition of regional dummies into the OLS and NLS estimation to account for regional steady state factor makes the estimates significant and increases their values for the relevant time spans. It also may be claimed that the higher rate of convergence in the 1990-2000 period might be a result of GAP that aims to reduce income disparities between GAP provinces and other most developed provinces of Turkey. Although one may argue that the effects of liberalization on the Turkish economy could increase the rate of convergence for this period, this may be questionable in that the economy of the provinces in GAP region is, in general, based on farming rather than industry.

Table II and III in Appendix III present the single cross-sectional results for the Mankiw, Romer, and Weil framework. The estimation results for equation (18) in Section 5 in which the human capital variable is an omitted variable as stated by Mankiw, Romer, and Weil (1992) are presented in Table II in Appendix III. In the unrestricted regressions, the estimated convergence parameters are significant for all sub periods and the longer periods. The only negative convergence rate is found for the 1980-1985 period. While the provinces in the sample are diverging at a rate of 0.01 per year for this period, there is evidence for the β convergence for all other periods included in the regressions. The highest convergence rate, 0.04 per year, is for the 1985-1990 period. For the longer periods, the implied convergence rate is almost the same, which is 0.01 per year. This shows that when only the post-liberalization period of 1980-2000 is considered, there is no substantial change in the rate of convergence parameter. This also can be claimed for the 1990-2000 period. Contrary to the results of regressions for unconditional convergence, we see that neither liberalization nor GAP has any positive effect on the estimated convergence parameter.

When the constrained regressions are considered, the convergence rates do not differ greatly from those obtained from unrestricted regressions except for the 1995-2000 period. While the convergence rate is 0.003 at this period for the unrestricted regression it increases to 0.01 per year at the same period for the restricted regression.

Our estimates in Table III in Appendix III are based on equation (19) in which the level of human capital is added to the right-hand side of the equation (18) with the assumption that the mean years of schooling (MYOS) of the labor force is more closely related to the level of human capital (h) than to the rate of accumulation (s_h).

With the inclusion of human capital into the regressions, the rate of convergence increases for all periods except the 1990-1995 period. Even though the fit of regressions does not rise at all, the higher convergence rates give an idea that the MYOS variable has a positive effect on the catching up process of provinces. However, at this stage, another problem, associated with MYOS variable, arises because of a negative or insignificant coefficient on it.[31] In the unrestricted regressions in Table III in Appendix III, the estimated coefficients on MYOS are, in general, insignificant at the 0.05 level. Moreover, a negative coefficient appears for the 1990-1995 period. The only significant estimates are obtained for the 1975-1980 and 1975-2000 periods. In the restricted case shown in Table III in Appendix III, the coefficients on MYOS variable are significant for the 1975-1980, 1995-2000, and 1975-2000 periods, and we have a negative coefficient on it for the 1990-1995 period. Although this negative coefficient is insignificant, this result is striking since it raises the question of whether there is a negative relationship between human capital variable and economic growth. Islam (1995) finding the same relationship argues the extent that the theoretical human capital variable used in the production function can be explained by the actual variable used in regressions. As stated by Islam (1995), so far, two kinds of responses to these problems have been argued. He argues,

> Many (particularly the less developed) countries *appear* to have made much progress, the true levels of human capital variable (and hence the output levels) in these countries have actually not increased by that much. Statistically this results in a negative *temporal* relationship between the human capital variable used and economic growth within countries.[32]

Another response to the problems above may be the richer specification of human capital variable in the production function. Islam (1995) states that the human capital variable proposed by Benhabib and Spiegel (1994) propose is a more complex specification concerning the relation among *A(t), H, g* and also the gap between the technology level of the individual country and that of leading country. Even if their specification gives a better result than previous specifications and proves that human capital has an important effect in the growth process. Yet the sign of the coefficient on this variable in the regressions is still questionable.

In our regressions, the human capital variable is measured by the mean years of schooling of the labor force as stated in Section 4. Although this specification is better than that of Mankiw, Romer, and Weil, there have been still some shortcomings in measuring it. Since it does not take into account the quality of education in different provinces of Turkey, even if its numerical value is the same for some provinces, it is not completely correct to say that the workers in those provinces have the same human capital. It is widely known that there are absolute discrepancies in the quality of education between the Eastern and the Western parts of Turkey (especially between the most developed and GAP provinces in our sample). In the Western part of Turkey, the class size of schools is relatively smaller than those in Eastern part, which provides students with closer interaction with the other students and teachers, and which increases the quality of the education. In GAP provinces, there are examples of joint classes in which first through fifth year students in primary schools are taught in the same classes with the same teachers. In a sense, the differences mentioned above in the quality of education may be an explanation to the insignificant or the negative coefficient on the human capital variable in our regressions.

Nevertheless, in the cross-sectional analysis, the framework of Mankiw, Romer, and Weil provides evidence that the MYOS variable used as a measure of human capital variable has a positive effect on convergence parameter among the most developed, developed and GAP provinces included in the sample.

Moreover, another surprising result of the cross-sectional regressions for the conditional convergence framework is that there is no considerable change in the rate of estimated convergence parameter for the 1975-2000, 1980-2000, and 1990-2000 periods. Only in the restricted regression in Table III, it is seen that there is an improvement in the rate of convergence (0.03 per year) among the selected provinces for the 1990-2000 period.

It would be interesting to examine the direct effect of human capital variable on the growth process of GAP provinces solely, however the size of the sample (9 provinces) then would be econometrically insufficient for the examination.

6.2. POOLED REGRESSION RESULTS

The third methodology used in this research to examine convergence process of the provinces in our sample is the Islam (1995) framework. As he mentions that the equations (18) and (19) imply a dynamic panel data model with $(1 - e^{-\beta . t}) \ln A(0)$ as individual country-effect term that is invariant to time. The number of observations substantially increases with this panel data model and it allows us to examine the speed of convergence both for the entire sample and for the pairs of most developed, developed and GAP provinces and for only GAP provinces. The pooled estimation results are presented in Tables IV, V, VI, and VII in Appendix III.

In Table IV in Appendix III, the estimation results for the entire sample are given for the 1975-2000 and 1980-2000 and 1990-200 periods with and without including the human capital variable in the regressions. The results for the unrestricted and restricted regressions are provided as before in the Table IV in Appendix III. The second and third columns give the estimates of coefficients on exogenous variables[33] for the 1975-2000 period. In the unrestricted regressions without MYOS, the implied values of convergence parameter are 0.016 and 0,021, 0.015 per year for the 1975-2000, 1980-2000, and 1990-2000 periods. With the inclusion of human capital into the regressions, the estimated convergence increases to 0,044 for the 1975-2000 period but almost remains the same (0,022 per year) for the 1980-2000. It can be seen that there is an improvement in the rate of convergence (0.022 per year) for the 1990-2000 period. The similar results are also found in the restricted regressions.[34] From the two types of estimation (unrestricted and restricted), it can be said that the sample of most developed, developed, and GAP provinces are converging on the average 0.02 per year for the 1975-2000, 1980-2000 and 1990-2000 periods without including human capital variable. In the regressions with MYOS, while the convergence rate of the entire sample is 0.04 per year for the 1975-2000 period it is around 0.02 per year for the 1980-2000 and 1990-2000 periods.

Since the panel data model provides us with sufficient observations to make further analysis of convergence parameter, the pooled regressions for the sample consisting of the most developed and GAP provinces are given in Table V, those for developed and GAP provinces in Table VI and those of only GAP provinces in Table VII in Appendix III.

In the unrestricted regressions without human capital variable in Table V, the rate of convergence is 0.047 per year for the period 1975-2000, 0.042 per year for the 1980-2000 period and 0,034 per year for the 1990-2000 period. When we include the human capital variable in the unrestricted regressions the implied value of convergence rate increases to 0,094 for the longest period but it does not raise that much (0,057 per year) for the 1980-2000 period. On the other hand, the convergence rate substantially increases to 0.08 per year for the 1990-2000 period with the inclusion of human capital variable into the unrestricted regressions. Nevertheless, the convergence rate is higher for the longest period than as in the 1980-2000 and 1990-2000 periods. In this respect, there is no evidence that either liberalization in Turkish economy or GAP has a positive effect on the convergence rate for the sample of the most developed and GAP provinces. Although the rate of convergence for all periods in the restricted regressions is smaller than as in the unrestricted one, the inclusion of human capital variable has a positive effect on the convergence rate for these periods.

Pooled regression for developed and GAP provinces in Table VI may be interpreted that there is higher convergence rate among similar economic units. Since the developed provinces of Turkey are more similar economically to GAP provinces, the estimates of convergence rate substantially increase for all periods except the 1990-2000 including human capital variable in the pooled regression. This may stem from the negative coefficient on MYOS. Although, for this period, GAP is expected to have a positive impact on convergence rate and human capital of the labor force, it is not the case. As stated before, provinces of Turkey (especially GAP provinces) may suffer from the specification of human capital variable that we use in our regressions. The higher rates of convergence among the developed and GAP provinces may be based on the hypothesis that the speed of convergence in income levels of relatively homogenous groups of economies is faster.

While the cross-sectional estimation for convergence of GAP provinces is not available because of insufficient observations, the pooled estimation results for them are provided in Table VII in Appendix III. The estimates of convergence parameter are significant for all periods except the 1980-2000 period where MYOS is included in the regression. In the unrestricted regressions, the inclusion of human capital variable increases the rate of convergence for all periods except the 1990-2000 period. Since the coefficient on MYOS is both insignificant and negative for this period, it may be argued that the economic structure of GAP region does not allow the human capital of the labor force in this region to increase the output levels strongly.

The estimates of convergence parameter for the pooled regressions, in general, are higher than the estimates for the cross-sectional regressions for the 1975-2000 and 1980-2000 and 1990-2000 periods. Even though the pooled regression results of Islam (1995) for the NONOIL, INTER, and OECD countries produce the similar results as the single cross-sectional results, dividing either the 1975-2000 or 1980-2000 periods into five-year time spans and regarding the growth process of provinces in the sample over shorter intervals increase the estimates of the rate of convergence.

Another result of the pooled regressions is that GAP seems to have no positive effect on the convergence rates for each group of sample in Tables IV, V, VI, and VII in Appendix III. This result may arise from poor specification of human capital variable based on only formal education attainments of labor force and also from relatively small time period to evaluate the effects of GAP on the Southeastern Anatolia region.

6.3. FIXED EFFECTS PANEL REGRESSION RESULTS

The assumption that the individual province effects are naturally fixed involves the least squares with dummy variables (LSDV) estimation. The results of fixed effects panel estimation are presented in Tables VIII, IX, X, and XI in Appendix III for the same samples mentioned in Section 6. B. It can be seen from the fixed effects estimation tables that the implied rates of convergence for all samples in the two periods (1975-2000 and 1980-2000) is higher than for pooled regressions. For the 1975-2000 period, the rates of convergence are 0.117, 0.153, and 0.238 for the entire sample, the sample of the most developed and GAP provinces, and the sample of developed and GAP provinces respectively. Moreover, we see that there is a slightly difference in the rates of convergence for the 1975-2000 and 1980-2000 periods. Again, for all sets of regressions, including the human capital variable in the unrestricted and restricted regressions raises the rate of convergence. The fixed effects panel estimation give different results from pooled regressions for GAP provinces. When the individual province effects are hold fixed, which allows them to change across provinces but not over time, we find that there is divergence in GAP provinces for the 1975-2000 and 1980-2000 periods. The only positive convergence rate is found in the 1990-2000 period.

7. ANALYSIS OF σ CONVERGENCE

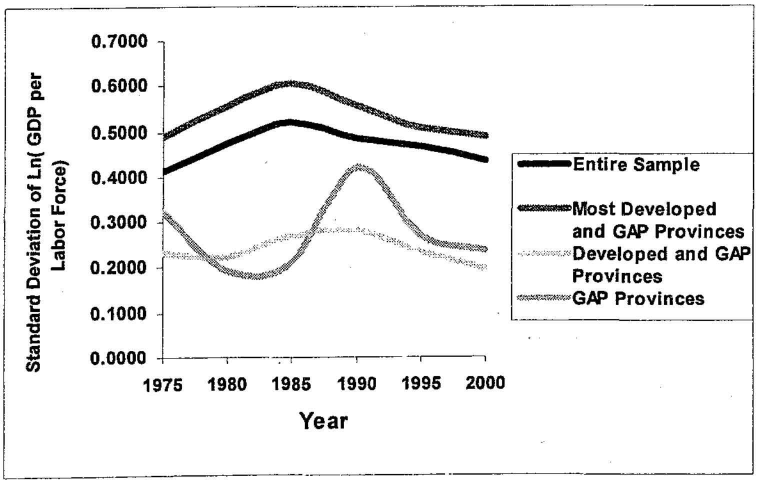
As stated before, the standard deviation of per capita income across provinces is used as a measure of the dispersion of per capita incomes. A decrease in the value of standard deviation over time implies that there is σ-convergence in those provinces. In this section, in order to examine the σ-convergence pattern of the most developed, developed and GAP provinces we used the GDP per labor force series over the time span 1975-2000. The standard deviation values of the cited provinces are given for five-year intervals in Table II. The figure representing the dispersion in output is also provided below.

Table II

The Standard Deviation of Ln (GDP per Labor Force)

Year	Entire Sample	Most Developed and GAP Provinces	Developed and GAP Provinces	GAP Provinces
1975	0.4132	0.4885	0.2347	0.3228
1980	0.4777	0.5585	0.2226	0.1925
1985	0.5186	0.6064	0.2677	0.2129
1990	0.4868	0.5545	0.2832	0.4221
1995	0.4645	0.5087	0.2311	0.2710
2000	0.4372	0.4894	0.1960	0.2381

Figure IV



As can be seen from Figure IV we observe that there is a similar pattern in the dispersion of GDP per labor series except the set of developed and GAP provinces. In general, the increasing path in the standard deviation seems to continue to 1985 and it starts decreasing after then. Only for the developed and GAP provinces, the dispersion of output falls dating from 1990. It can be said that while there is σ convergence in the 1985-2000 period for the entire sample and for the group of most developed and GAP provinces, it is observed in the 1990-2000 period for the group of developed and GAP provinces.

On the other hand, the dispersion in the output per labor force for GAP provinces is more volatile than for other groups. Although there is a decrease in the dispersion 1975- 1980, an increasing path can be observed for the years between 1980 and 1990 before following the declining trend of dispersion in the 1990-2000 period. It may be concluded that there is σ convergence for GAP provinces for the 1990-2000 period.

Although we find that there is β convergence among the provinces in our sample for the 1975-2000 period, the σ convergence seems to appear only for the 1985-2000 period, which confirms that β convergence is a necessary but not sufficient condition for σ convergence.

8. CONCLUSIONS

The main goal of this study is to indicate the differences in development levels of provinces in Turkey. The determination of provinces in our sample is based on the Human Development Index (HDI) in the Human Development Report (HDR) Turkey 2001. Instead of examining the disparities in development indicators used in HDI in a regional level, we analyze provinces to make inferences about economic developments of the most developed, developed and GAP provinces. In Section 3, the HDI values and the figures of mean years of schooling of the labor force as a measure of human capital for the cited provinces are provided in order to examine the economic and development process from 1975 to 2000. Table I in Appendix I indicates that there are improvements in the levels of development over time; however, the disparities in development indicators almost do not change. The same conclusion can be made for the mean years of schooling of the labor force in the most developed, developed, and GAP provinces. Although it is seen that the educational attainments of the labor force have increased continuously since 1975, the provinces having the low education levels in 1975 again possess the relatively poor levels in 2000.

The second goal of this study is to investigate whether the poor provinces in Turkey catch up with their rich counter parts over time. Though the output levels of provinces are not the sole indicator of economic development, the convergence on income levels is considered as an important part of that. While examining convergence patterns we use convergence methodologies of Barro and Sala-i Martin (1992), Mankiw, Romer, and Weil (1992) with a cross-sectional data and the methodology of Islam (1995) with a panel data approach.

The first finding from the single cross-sectional framework of Barro and Sala-i Martin (1992) in this study is that the most developed, developed, and GAP provinces are unconditionally converging toward each other at the rates of 0.04 per year for the 1975-2000 and 1980-2000 periods, and 0.06 per year for the 1990-2000 year. Second, when we include regional dummies to account for the differences in steady state levels both OLS and NLS estimation results become significant and increase for the relevant time periods. Third, the higher rate of convergence for the entire sample in the 1990-2000 period may stem from the effect of GAP that aims to reduce income disparities between GAP provinces and other most developed provinces of Turkey.

The results from Mankiw, Romer and Weil's (1992) framework, in which the human capital variable is an omitted variable, show that there is also a conditional convergence in productivity levels of the most developed, developed, and GAP provinces for the 1975-2000, 1980-2000, 1990-2000 periods. However, the conditional convergence rates for these periods are less than the unconditional rates. Again the greatest speed of convergence that is roughly 0.02 per year is found for the 1990-2000 period. With the inclusion of the human capital variable into the regressions the speed of convergence increases for all periods but it is almost the same for the 1975-2000 and 1990-2000 periods.

The framework of Islam (1995) provides us with sufficient observations to make regressions for the entire sample, the pairs of the most developed, developed, and GAP provinces and for only GAP provinces. The estimates of convergence parameter is higher than those in the single cross-sectional results for the entire sample which means that dividing all of the 1975-2000, 1980-2000, 1990-2000 periods into five-year time intervals increase the speed of convergence. It can also be said in conclusion that GAP seems to have no positive effect on the speed of convergence for each sample in the pooled regressions.

In the fixed effects estimations, the implied rates of convergence are generally higher than those obtained from pooled regressions for all samples except the sample of GAP provinces. For GAP provinces, the positive convergence rate is only found in the 1990-2000 period yet the estimates from fixed effects where the human capital variable is included in the regression is insignificant.

All in all, this study shows that there is β convergence in the productivity levels of the sample consisting of the most developed, developed, and GAP provinces in Turkey. However, the development levels of the cited provinces regarding HDI and mean years of the schooling of the labor force do not change substantially over the time period 1975-2000. Although GAP causes an increase in the rate of the unconditional convergence from single cross-sectional regressions for the entire sample, it seems to have no positive effect on the convergence rate conditional on human capital variable.

APPENDICES

APPENDIX I

HDI in HDR (2001) is based on three variables and the minimum and maximum values of these variables are fixed.

(1) Life Expectancy at Birth: the ages of 25-85

(2) Adult Literacy Rate: 0%-100%

Combined Primary, Secondary and Tertiary Gross Enrollment Ratio: 0%-100%

(3) Real GDP: $100-$40,000

Each index for any component of HDI is computed by the following formula:

Index= (Actual value – Minimum value)/(Maximum value- Minimum value)

HDI for each province is the average of three indices.

Table I
Human Development Index of the Provinces

HDI Rank	Most Developed Provinces	HDI(1975)	Life Expectancy at Birth 1997	Combined Primary, Secondary and Tertiary Gross Enrollment Ratio 1997	Total Schooling Rate 1997	Real GDP per capita($)	HDI(1997)	GDP per capita rank minus HDI rank
1	Kocaeli	0.650	74.8	90.8	65.3	16991.8	0.837	0
3	İstanbul	0.667	73.3	93.1	71.1	10237.8	0.812	0
4	Bursa	0.617	76.2	88.8	71.1	7420.2	0.801	11
5	İzmir	0.626	73.1	89.7	72.2	9394.9	0.800	0
6	Ankara	0.592	67.6	92.4	90.5	7590.5	0.784	7
7	Muğla	0.565	72.9	88.6	58.4	8776.2	0.777	0
8	Sakarya	0.584	76.2	87.4	60.7	5861.6	0.773	20
9	Eskişehir	0.592	67.8	91.9	79.1	7144.2	0.768	11
10	Bilecik	0.560	69.3	89.4	65.3	8815.0	0.766	-4
11	Tekirdag	0.568	70.1	89.9	66.5	7678.9	0.766	-1

HDI Rank	Developed Provinces	HDI(1975)	Life Expectancy at Birth 1997	Combined Primary, Secondary and Tertiary Gross Enrollment Ratio 1997	Total Schooling Rate 1997	Real GDP per capita($)	HDI(1997)	GDP per capita rank minus HDI rank
31	Nevşehir	0.523	65.3	85.5	56.2	6980.4	0.713	-10
33	Hatay	0.514	68.9	86.6	58.4	5523.1	0.712	-2
34	Isparta	0.535	67.1	88.8	60.7	4535.8	0.711	13
36	Kütahya	0.529	67.9	84.0	58.4	5059.6	0.708	2
38	Rize	0.515	64.3	82.3	67.6	5600.7	0.700	-8
40	Amasya	0.513	65.1	83.9	65.3	4902.2	0.698	3
42	Kırşehir	0.500	63.7	83.8	71.1	4568.1	0.693	4
43	Afyon	0.513	69.0	84.9	49.3	3824.3	0.690	11
45	Çorum	0.489	67.7	77.3	51.6	5100.6	0.685	-10
46	Malatya	0.497	67.1	80.2	59.6	4106.8	0.685	5

HDI Rank	GAP provinces	HDI(1975)	Life Expectancy at Birth 1997	Combined Primary, Secondary and Tertiary Gross Enrollment Ratio 1997	Total Schooling Rate 1997	Real GDP per capita($)	HDI(1997)	GDP per capita rank minus HDI rank
39	Gaziantep	0.526	70.9	75.9	52.7	4921.6	0.699	3
65	Diyarbakır	0.457	69.0	58.9	40.1	3738.1	0.621	-10
67	Adıyaman	0.394	63.9	69.8	48.1	2683.9	0.608	2
71	Mardin	0.423	67.0	56.0	35.5	2901.7	0.585	-8
72	Şanlıurfa	0.420	64.8	58.1	36.7	2962.0	0.580	-10
73	Siirt	0.402	64.4	57.2	35.5	2901.7	0.573	-9

APPENDIX II

Table I

	Mean Years of Schooling of the Labor Force					
Most Developed Provinces	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**
Kocaeli	4.44	5.28	5.75	6.18	6.60	7.04
Istanbul	5.78	6.40	6.76	7.11	7.55	8.01
Bursa	3.87	4.75	5.23	5.82	6.36	7.07
Izmir	4.60	5.40	5.87	6.26	6.81	7.45
Ankara	5.48	6.40	6.89	7.63	7.78	8.81
Mugla	3.55	4.29	4.99	5.45	5.96	6.64
Sakarya	3.58	4.27	4.73	5.10	5.61	6.33
Eskisehir	4.53	5.39	5.91	6.43	7.03	7.78
Bilecik	3.56	4.42	5.14	5.61	6.11	6.69
Tekirdag	3.79	4.63	5.17	5.73	6.25	6.90
Developed Provinces	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**
Nevsehir	3.36	3.94	4.66	5.07	5.43	5.86
Hatay	3.16	3.92	4.66	4.89	5.29	5.70
Isparta	3.86	4.56	5.28	5.76	6.22	6.76
Kutahya	3.15	3.69	4.45	4.82	5.28	5.82
Rize	3.45	3.67	4.51	4.94	5.43	6.08
Amasya	3.25	3.95	4.62	4.97	5.49	6.19
Kırsehir	3.20	3.98	4.69	5.15	5.63	6.21
Afyon	3.23	3.89	4.55	4.99	5.38	5.83
Corum	2.37	3.15	3.76	4.17	4.61	5.18
Malatya	2.85	3.65	4.37	5.03	5.59	6.39
GAP Provinces	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**
Gaziantep	2.89	3.61	4.30	4.68	5.20	5.85
Diyarbakır	2.03	2.66	3.14	3.64	4.15	4.78
Adıyaman	1.72	2.41	3.30	3.83	4.41	5.19
Mardin	1.63	2.12	2.74	3.33	3.93	4.70
Sanlıurfa	1.81	2.34	2.86	3.35	3.77	4.27
Siirt	1.68	2.15	2.90	3.29	2.12	4.85
Turkey	3.49	4.20	4.80	5.29	5.78	6.50

APPENDIX III

Barro and Sala-i Martin (1992) Framework Regression Results

Table I

Regression Equation: $\frac{1}{T} \cdot \log\left[\frac{y_{i,t_0+T}}{y_{i,t_0}}\right] = a - \frac{1-e^{-\beta \cdot T}}{T} \cdot \log(y_{i,t_0}) + u_{i,t_0,t_0+T}$ $\quad B = 1 - e^{-\beta . T}$

Time Period	Parameter Estimated	OLS	OLS with Regional Dummies		NLS	NLS with Regional Dummies
1975-1980	B	-0.0136	0.2127*	β	-0.0027	0.0478**
		(-0.1446)	(2.1844)		(-0.1456)	(1.9937)
	Implied β	-0.0027	0.0478			
	$\bar{R}^2$	-0.0408	0.3339		-0.0408	0.3339
1980-1985	B	-0.0544	-0.0133	β	-0.0106	-0.0026
		(-1.0319)	(-0.1543)		(-1.0595)	(-0.1553)
	Implied β	-0.0106	-0.0026			
	$\bar{R}^2$	0.0026	-0.0535		0.0026	-0.0535
1985-1990	B	0.1642*	0.2943*	β	0.0359**	0.0697**
		(2.0417)	(2.2063)		(1.8418)	(1.8440)
	Implied β	0.0359	0.0697			
	$\bar{R}^2$	0.0923	0.1472		0.0923	0.1472
1990-1995	B	0.0838	0.2375*	β	0.0175	0.0542*
		(1.2746)	(3.0297)		(1.2196)	(2.6370)
	Implied β	0.0175	0.0542			
	$\bar{R}^2$	0.0521	0.2013		0.0521	0.2013
1995-2000	B	0.0786*	0.2692*	β	0.0164**	0.0627*
		(2.0067)	(5.3002)		(1.9256)	(4.5123)
	Implied β	0.0164				
	$\bar{R}^2$	0.1080	0.5217		0.1080	0.5217
1975-2000	B	0.2003	0.6213*	β	0.0089	0.0388*
		(1.5548)	(6.1164)		(1.3857)	(3.6215)
	Implied β	0.0089	0.0388			
	$\bar{R}^2$	0.0536	0.6496		0.0536	0.6496
1980-2000	B	0.1888*	0.5391*	β	0.0105**	0.0387*
		(2.1843)	(4.3581)		(1.9630)	(2.8849)
	Implied β	0.0105	0.0387			
	$\bar{R}^2$	0.1311	0.5065		0.1311	0.5065
1990-2000	B	0.1600*	0.4424*	β	0.0174*	0.0584*
		(2.4674)	(6.1923)		(2.2585)	(4.5580)
	Implied β	0.0174	0.0584			
	$\bar{R}^2$	0.1691	0.5913		0.1691	0.5913

NOTE-The t-ratios of the estimates based on White heteroskedasticity-consistent standard errors are in parentheses. The dependent variable is the growth rate of real income per labor force over the indicated time periods. The number of observations is 26. While coefficients with a (*) are significant at 0.05 level (t-statistic=2.060), those with (**) are significant at 0.10 level (t-statistic=1.708).

Table II
Tests for Conditional Convergence without Human Capital

Dependent Variable: ln (y_t)								
	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	1975-2000	1980-2000	1990-2000
				UNRESTRICTED				
Constant	-1.1516	-0.0171	-0.1492	-0.2545	0.0774	-1.2088	-0.1056	-0.1006
	(-1.6746)	(-0.0373)	(-0.3655)	(-0.5275)	(0.2130)	(-0.9875)	(-0.1344)	(-0.1647)
ln (y_{t-1})	0.9362*	1.0509*	0.8071*	0.8738*	0.9852*	0.7016*	0.7923*	0.8518*
	(7.5416)	(12.7408)	(5.6851)	(12.4645)	(18.9250)	(4.1784)	(6.0839)	(9.5511)
ln (ind-share)	0.1525**	0.0036	0.0733	0.0937**	-0.0583	0.2699*	0.0653	0.0294
	(1.9364)	(0.0634)	(0.9049)	(1.7752)	(-1.3136)	(2.0954)	(0.6108)	(0.4413)
ln (n+g+ δ)	-0.2908	-0.0336	-0.0998	-0.0743	-0.0771	-0.4171	-0.2040	-0.1318
	(-1.3099)	(-0.1767)	(-0.8543)	(-0.5320)	(-0.7340)	(-1.0725)	(-0.8209)	(-0.7210)
$\overline{R}^2$	0.8554	0.9357	0.7760	0.9227	0.9587	0.6541	0.7661	0.8617
Implied β	0.0132	-0.0099	0.0429	0.0270	0.0030	0.0142	0.0116	0.0160
				RESTRICTED				
Constant	-0.7644*	0.0386	-0.1083	-0.3086	0.4566	-0.8033	0.2106	0.1769
	(-2.1240)	(0.1958)	(-0.3523)	(-1.0877)	(1.9309)	(-1.2359)	(0.4029)	(0.5025)
ln (y_{t-1})	0.9112*	1.0454*	0.7965*	0.8795*	0.9513*	0.6705*	0.7568*	0.8324*
	(7.7991)	(14.9486)	(9.1030)	(15.7943)	(20.4540)	(4.6097)	(6.8135)	(11.4111)
ln (ind-share)	0.1530**	0.0086	0.0803	0.0925**	-0.0524	0.2725*	0.0806	0.0362
- ln (n+g+ δ)	(1.9674)	(0.2030)	(1.3426)	(1.8157)	(-1.1703)	(2.1584)	(0.7917)	(0.5619)
$\overline{R}^2$	0.8589	0.9384	0.7852	0.9260	0.9572	0.6668	0.7733	0.8658
Implied β	0.0186	-0.0089	0.0455	0.0257	0.0100	0.0160	0.0139	0.0183
Implied α	0.6328	-0.2323	0.2829	0.4344	14.1900	0.4527	0.2488	0.1055
Wald Test								
F-statistic	0.4407	0.0183	0.0300	0.0197	1.8454	0.1552	0.2985	0.3136

NOTE-The t-ratios of the estimates based on White heteroskedasticity-consistent standard errors are in parentheses. The dependent variable is the growth rate of real income per labor force over the indicated time periods. The number of observations is 26. While coefficients with a (*) are significant at 0.05 level (t-statistic=2.060), those with a (**) are significant at 0.10 level (t-statistic=1.708).

Table III
Tests for Conditional Convergence with Human Capital

Dependent Variable: ln (y_t)

	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	1975-2000	1980-2000	1990-2000
UNRESTRICTED								
Constant	-1.3246*	0.0161	-0.4364	-0.1406	-0.1730	-0.8273	-0.1538	-0.3496
	(-2.1756)	(0.0330)	(-0.7514)	(-0.2761)	(-0.4671)	(-0.7106)	(-0.1947)	(-0.5471)
ln (y_{t-1})	0.7568*	1.0229*	0.7174*	0.9374*	0.9000*	0.4426*	0.6512*	0.7482*
	(5.1697)	(7.3090)	(4.5676)	(8.6043)	(13.3249)	(2.1697)	(3.2237)	(6.0724)
ln (ind-share)	0.0982	0.0065	0.0688	0.0870	-0.0478	0.1700	0.0505	0.0230
	(1.6139)	(0.1107)	(0.8053)	(1.6103)	(-1.1291)	(1.2996)	(0.4648)	(0.3483)
ln (n+g+ δ)	-0.2678	0.0026	-0.0943	-0.0986	-0.0492	-0.0667	-0.0730	-0.0762
	(-1.3755)	(0.0107)	(-0.7959)	(-0.6820)	(-0.4882)	(-0.1648)	(-0.2538)	(-0.4078)
ln (MYOS)	0.4203*	0.0525	0.2549	-0.1401	0.2254**	0.6888**	0.3459	0.3115
	(3.3492)	(0.2508)	(0.7914)	(-0.7681)	(1.8491)	(1.9980)	(0.9166)	(1.2057)
$\bar{R}^2$	0.8918	0.9328	0.7721	0.9212	0.9623	0.6355	0.7644	0.8645
Implied β	0.0557	-0.0045	0.0664	0.0129	0.0211	0.0326	0.0214	0.0290
RESTRICTED								
Constant	-0.8483*	0.0021	-0.3980	-0.1141	0.0572	-1.0975	-0.1145	-0.2557
	(-2.8465)	(0.0087)	(-0.7369)	(-0.3030)	(0.1971)	(-1.7570)	(-0.1978)	(-0.4905)
ln (y_{t-1})	0.7298**	1.0262**	0.7070*	0.9324*	0.8670*	0.4741*	0.6411*	0.7287*
	(5.1954)	(10.5113)	(4.8447)	(10.7077)	(14.7126)	(2.8560)	(4.7433)	(7.2474)
ln (ind-share)	0.0999	0.0053	0.0755	0.0879	-0.0426	0.1731	0.0519	0.0261
- ln (n+g+ δ)	(1.5515)	(0.1188)	(0.9719)	(1.6997)	(-1.0125)	(1.3564)	(0.4251)	(0.4082)
ln (MYOS)	0.4120*	0.0485	0.2556	-0.1361	0.2516*	0.6566*	0.3592	0.3277
	(3.0710)	(0.2882)	(0.8117)	(-0.7946)	(2.1127)	(2.0665)	(1.2922)	(1.3288)
$\bar{R}^2$	0.8918	0.9359	0.7820	0.9248	0.9628	0.7083	0.7751	0.8702
Implied β	0.0630	-0.0052	0.0694	0.0140	0.0286	0.0299	0.0222	0.0316
Implied α	0.2700	-0.2531	0.2049	0.5653	-0.4703	0.2476	0.1263	0.0527
Implied φ	1.1131	-2.3245	0.6935	-0.8754	2.7803	0.9394	0.8744	0.6621
Wald Test								
F-statistic	1.0209	0.0011	0.0455	0.0063	1.0033	0.0770	0.0062	0.0819

NOTE-The t-ratios of the estimates based on White heteroskedasticity-consistent standard errors are in parentheses. The dependent variable is the growth rate of real income per labor force over the indicated time periods. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. The number of observations is 26. While coefficients with a (*) are significant at 0.05 level (t-statistic=2.060), those with a (**) are significant at 0.10 level (t-statistic=1.708).

Table IV
Pooled Regression for the Entire Sample

Dependent Variable: ln (y_t)						
	1975-2000	1975-2000	1980-2000	1980-2000	1990-2000	1990-2000
UNRESTRICTED						
ln ($y_{i,t-1}$)	0.9239*	0.8022*	0.9016*	0.8950*	0.9261*	0.8951*
	(29.5843)	(19.1112)	(28.6248)	(27.7432)	(27.0163)	(28.4640)
ln (ind-share)	0.0959*	0.0687*	0.0702*	0.0685*	0.0463*	0.0479*
	(4.0905)	(3.0063)	(3.2168)	(2.9389)	(2.0916)	(2.0873)
ln (n+g+ δ)	-0.1363*	-0.0653	-0.0809*	-0.0767*	-0.1111*	-0.1154*
	(-4.3850)	(-1.5539)	(-3.1034)	(-2.8725)	(-2.0642)	(-2.0850)
ln (MYOS)	***	0.2433*	***	0.0169	***	0.1063**
	***	(4.3920)	***	(0.3453)	***	(1.6462)
$\bar{R}^2$	0.9812	0.9856	0.9879	0.9878	0.9373	0.9352
Implied β	0.0158	0.0441	0.0207	0.0222	0.0154	0.0222
RESTRICTED						
ln($y_{i,t-1}$)	0.9059*	0.8037*	0.8994*	0.8923*	0.9055*	0.8702*
	(40.7976)	(24.6748)	(51.3615)	(40.8057)	(42.2543)	(37.9657)
ln(ind-share) - ln(n+g+ δ)	0.1058*	0.0684*	0.0699*	0.0676*	0.0462*	0.0484*
	(5.3503)	(3.2877)	(4.3375)	(3.7398)	(2.1359)	(2.2685)
ln(myos)	***	0.2412*	***	0.0214	***	0.1155**
	***	(4.5221)	***	(0.4093)	***	(1.8056)
$\bar{R}^2$	0.9802	0.9856	0.9878	0.9878	0.9381	0.9363
Implied β	0.0198	0.0437	0.0212	0.0228	0.0199	0.0278
Implied α	0.5294	0.2584	0.4101	0.3855	0.3285	0.2715
Implied φ	***	0.9112	***	0.1224	***	0.6484
Wald Test for restriction:						
F-statistic	1.1271	0.0056	0.0891	0.0513	1.3742	1.3661
p-value	0.2904	0.9404	0.7659	0.8212	0.2469	0.2484

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t.The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table V
Pooled Regression for the Most Developed and GAP Provinces

Dependent Variable ln (y_t)						
	1975-2000	**1975-2000**	**1980-2000**	**1980-2000**	**1990-2000**	**1990-2000**
			UNRESTRICTED			
ln ($y_{i,t-1}$)	0.7927*	0.6242*	0.8081*	0.7536*	0.8432*	0.6748*
	(20.0380)	(14.596)	(22.2346)	(20.9067)	(20.7042)	(13.1391)
ln (ind-share)	0.1747*	0.1146*	0.1307*	0.1080*	0.0995*	0.1095*
	(6.1769)	(4.0114)	(5.4387)	(3.8757)	(3.5340)	(4.1279)
ln (n+g+ δ)	-0.1162*	-0.0634**	-0.0957*	-0.0731*	-0.1043**	-0.0707**
	(-3.9345)	(-1.8272)	(-4.1092)	(-2.6894)	(-1.6790)	(-1.8483)
ln (MYOS)	***	0.3538*	***	0.1356*	***	0.3681*
	***	(5.1845)	***	(2.0805)	***	(5.8403)
$\overline{R}^2$	0.9027	0.9223	0.9133	0.9173	0.9342	0.9387
Implied β	0.0465	0.0943	0.0426	0.0566	0.0341	0.0787
			RESTRICTED			
ln ($y_{i,t-1}$)	0.8241*	0.6433*	0.8279*	0.7697*	0.8416*	0.6846*
	(38.0372)	(16.6348)	(47.7061)	(25.8710)	(28.7248)	(19.8945)
ln (ind-share) - ln (n+g+ δ)	0.1549*	0.1014*	0.1174*	0.0952*	0.1002*	0.1049*
	(7.7562)	(4.8840)	(7.7022)	(4.9196)	(3.8500)	(5.9721)
ln (MYOS)	***	0.3597*	***	0.1398*	***	0.3625*
	***	(5.7300)	***	(2.2701)	***	(6.2177)
$\overline{R}^2$	0.9053	0.9241	0.9160	0.9197	0.9364	0.9396
Implied β	0.0387	0.0882	0.0378	0.0524	0.0345	0.0758
Implied α	0.4683	0.2213	0.4055	0.2924	0.3874	0.2496
Implied φ	***	0.7853	***	0.4295	***	0.8625
Wald Test for restriction:						
F-statistic	1.7859	1.2882	0.9126	0.7513	0.0053	0.7645
p-value	0.1854	0.2600	0.3433	0.3896	0.9427	0.3896

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table VI
Pooled Regression for Developed and GAP Provinces

Dependent Variable ln (y_t)	1975-2000	1975-2000	1980-2000	1980-2000	1990-2000	1990-2000
UNRESTRICTED						
ln ($y_{i,t-1}$)	0.7609*	0.4707*	0.7708*	0.6900*	0.8138*	0.8209*
	(9.8036)	(5.4250)	(12.0440)	(7.7183)	(12.5189)	(17.1246)
ln (ind-share)	0.0606*	0.0330	0.0258	0.0263	-0.0519	-0.0514
	(2.4462)	(1.4449)	(1.1139)	(1.1808)	(-1.4083)	(-1.3584)
ln (n+g+ δ)	-0.1498*	-0.1034*	-0.0968*	-0.0901*	0.0326	0.0295
	(-4.0809)	(-5.1635)	(-3.5601)	(-4.0181)	(0.6836)	(0.3987)
ln (MYOS)	***	0.3606*	***	0.1087**	***	-0.0337
	***	(8.5738)	***	(1.6779)	***	(-0.3397)
$\bar{R}^2$	0.5771	0.6550	0.6151	0.6135	0.7379	0.7300
Implied β	0.0547	0.1507	0.0521	0.0742	0.0412	0.0395
RESTRICTED						
ln ($y_{i,t-1}$)	0.7362*	0.4578*	0.7479*	0.6557*	0.8015*	0.8116*
	(10.0370)	(5.6269)	(12.9942)	(7.9817)	(15.9901)	(14.9282)
ln (ind-share) - ln (n+g+ δ)	0.0779*	0.0483*	0.0513*	0.0448*	-0.0570**	-0.0549**
	(3.7819)	(2.6585)	(3.3656)	(3.1382)	(-1.7468)	(-1.6967)
ln (MYOS)	***	0.3529*	***	0.1308*	***	-0.0455
	***	(7.2155)	***	(1.9829)	***	(-0.5197)
$\bar{R}^2$	0.5784	0.6578	0.6148	0.6164	0.7439	0.7361
Implied β	0.0613	0.1563	0.0581	0.0844	0.1494	0.1494
Implied α	0.2279	0.0818	0.1691	0.1152	-0.4026	-0.4113
Implied φ	***	0.5977	***	0.3362	***	-0.3406
Wald Test for restriction:						
F-statistic	3.8998	4.2039	3.6657	3.3110	0.1494	0.0906
p-value	0.0519	0.0438	0.0715	0.0739	0.7020	0.7657

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table VII
Pooled Regression for GAP Provinces

Dependent Variable ln (y_t)						
	1975-2000	**1975-2000**	**1980-2000**	**1980-2000**	**1990-2000**	**1990-2000**
			UNRESTRICTED			
ln ($y_{i,t-1}$)	0.5146*	0.2423**	0.5994*	0.3440	0.5913*	0.6678*
	(3.3492)	(1.9727)	(4.1559)	(1.5682)	(5.1003)	(4.7993)
ln (ind-share)	0.1695*	0.0722	0.1252**	0.0696	0.0784	0.0685
	(2.4328)	(1.2794)	(1.8126)	(1.0368)	(1.5026)	(0.9675)
ln (n+g+ δ)	-0.0994**	-0.0592	-0.0914*	-0.0647	0.4967*	0.5268*
	(-2.9358)	(-1.5789)	(-4.1935)	(-1.4487)	(4.4983)	(4.1470)
ln (MYOS)	***	0.5913*	***	0.4919**	***	-0.1205
	***	(8.2592)	***	(1.9196)	***	(-0.6696)
$\bar{R}^2$	0.4549	0.6669	0.4890	0.5556	0.7027	0.6680
Implied β	0.1329	0.2835	0.1024	0.2134	0.1051	0.0808
			RESTRICTED			
ln ($y_{i,t-1}$)	0.5811*	0.2352*	0.6382*	0.3573**	0.5682*	0.6020*
	(5.9531)	(2.5271)	(10.5014)	(1.9778)	(3.9758)	(2.9982)
ln (ind-share) - ln (n+g+ δ)	0.1342*	0.0169*	0.1062*	0.0736*	0.0117	-0.0011
	(4.6416)	(2.7590)	(7.1932)	(2.5926)	(0.1951)	(-0.0126)
ln (MYOS)	***	0.5968*	***	0.4530**	***	-0.0522
	***	(8.8446)	***	(1.9649)	***	(-0.1840)
$\bar{R}^2$	0.4953	0.6815	0.5278	0.5736	0.7163	0.6858
Implied β	0.1086	0.2895	0.0898	0.2059	0.1130	0.1015
Implied α	0.2426	0.0216	0.2270	0.1028	0.0264	-0.0027
Implied φ	***	0.7634	***	0.6323	***	-0.1315
Wald Test for restriction:						
F-statistic	0.5841	0.0258	0.1571	0.0025	72.4847	43.2883
p-value	0.4516	0.8738	0.6961	0.9606	0.0000	0.0003

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645) for the 1975-2000 period. t-statistics are 2.069 and 1,714 for 0.05 and 0.10 level of significance for the 1980-2000 period. t-statistics are 2.201 and 1,796 for 0.05 and 0.10 level of significance for the 1990-2000 period.

Table VIII
Fixed Effects Panel Regression for the Entire Sample

	Dependent Variable: ln (y_t)					
	1975-2000	**1975-2000**	**1980-2000**	**1980-2000**	**1990-2000**	**1990-2000**
			UNRESTRICTED			
ln ($y_{i,t-1}$)	0.5560*	0.2605*	0.5239*	0.2413*	0.0701	-0.0665
	(17.4081)	(5.8472)	(12.4612)	(2.6282)	(0.7650)	(-0.7848)
ln (ind-share)	0.2513*	0.0972*	0.1492*	0.0711*	0.2086**	0.2524*
	(7.2060)	(3.7377)	(4.2652)	(1.9739)	(1.7216)	(2.0027)
ln (n+g+ δ)	-0.1823*	-0.0971*	-0.1461*	-0.0996*	0.6797*	0.1821
	(-5.2990)	(-4.0412)	(-4.7720)	(-3.7378)	(2.6820)	(0.5911)
ln (MYOS)	***	0.6097*	***	0.5665*	***	0.6483*
	***	(12.4880)	***	(5.5949)	***	(2.6184)
$\overline{R}^2$	0.9923	0.9944	0.9926	0.9945	0.9721	0.9751
Implied β	0.1174	0.2691	0.1293	0.2844	0.5314	No convergence
			RESTRICTED			
ln ($y_{i,t-1}$)	0.5763*	0.2519*	0.5320*	0.2571*	0.3768*	-0.0272
	(23.5340)	(8.4006)	(14.8646)	(3.3913)	(4.1047)	(-0.2921)
ln (ind-share) - ln (n+g+ δ)	0.2204*	0.0908*	0.1413*	0.0871*	0.0070	0.2092*
	(10.5422)	(6.0264)	(9.1721)	(5.8757)	(0.0716)	(1.9798)
Ln (MYOS)	***	0.6254*	***	0.5357*	***	0.8929*
	***	(18.8157)	***	(6.5083)	***	(5.6246)
$\overline{R}^2$	0.9924	0.9948	0.9925	0.9943	0.9635	0.9747
Implied β	0.1102	0.2757	0.1262	0.2716	0.1952	No convergence
Implied α	0.3422	0.1083	0.2319	0.1050	0.0112	0.1692
Implied φ	***	0.7455	***	0.6454	***	0.7222
Wald Test for restriction:						
F-statistic	1.4462	0.0000	0.0034	0.3323	10.3074	1.9265
p-value	0.2314	0.9961	0.9539	0.5657	0.0023	0.1716

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table IX
Fixed Effects Panel Regression for the Most Developed and GAP Provinces

Dependent Variable: ln (y_t)						
	1975-2000	**1975-2000**	**1980-2000**	**1980-2000**	**1990-2000**	**1990-2000**
			UNRESTRICTED			
ln ($y_{i,t-1}$)	0.4662*	0.2904*	0.4618*	0.3091*	0.1794*	-0.0142
	(12.2248)	(4.9984)	(9.3349)	(2.6884)	(12.3722)	(-0.2354)
ln (ind-share)	0.3437*	0.1852*	0.2422*	0.1733*	0.5044*	0.5857*
	(8.7608)	(5.2152)	(7.1912)	(4.0609)	(27.3430)	(9.6221)
ln (n+g+ δ)	-0.1025*	-0.0989*	-0.1110*	-0.1126*	0.1949*	-0.4095*
	(-4.0036)	(-3.4334)	(-5.5290)	(-3.9245)	(7.0875)	(-3.6387)
ln (MYOS)	***	0.5059*	***	0.4073*	***	0.7115*
	***	(6.9316)	***	(3.0194)	***	(6.4508)
$\overline{R}^2$	0.9287	0.9474	0.9349	0.9396	0.9860	0.9926
Implied β	0.1526	0.2473	0.1545	0.2348	0.3436	No convergence
			RESTRICTED			
ln ($y_{i,t-1}$)	0.5663*	0.2867*	0.5007*	0.3186*	0.3335*	-0.0297*
	(20.7423)	(4.6158)	(10.7124)	(2.8321)	(18.8004)	(-5.0270)
ln (ind-share) - ln (n+g+ δ)	0.2356*	0.1390*	0.1779*	0.1338*	0.4859*	0.5709*
	(8.5333)	(5.7839)	(7.6184)	(6.1232)	(9.33139	(187.4021)
ln (MYOS)	***	0.5563*	***	0.4236*	***	0.7974*
	***	(6.5194)	***	(3.0341)	***	(149.3056)
$\overline{R}^2$	0.9238	0.9489	0.9358	0.9411	0.9817	0.9929
Implied β	0.1137	0.2498	0.1384	0.2288	0.2196	No convergence
Implied α	0.3520	0.1631	0.2627	0.1641	0.4216	0.3567
Implied φ	***	0.6528	***	0.5196	***	0.4982
Wald Test for restriction:						
F-statistic	19.5833	3.4156	8.8435	1.1819	5964.17	665.8211
p-value	0.0000	0.0685	0.0042	0.2813	0.0000	0.0000

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table X
Fixed Effects Panel Regression for Developed and GAP Provinces

Dependent Variable: ln (y_t)						
	1975-2000	1975-2000	1980-2000	1980-2000	1990-2000	1990-2000
			UNRESTRICTED			
ln ($y_{i,t-1}$)	0.3049*	0.0935*	0.3131*	-0.1070	0.0153	0.1539*
	(2.9480)	(1.2349)	(4.0019)	(-0.8744)	(0.6452)	(2.1975)
ln (ind-share)	0.2156*	0.0453	0.1278*	0.0257	0.0728	0.1932**
	(4.1228)	(1.4456)	(3.3753)	(0.6535)	(1.0940)	(1.7982)
ln (n+g+ δ)	-0.1850*	-0.0805*	-0.1645*	-0.0980*	0.9190**	1.5032**
	(-4.5212)	(-3.6273)	(-3.2953)	(-3.0575)	(12.509)	(5.2835)
ln (MYOS)	***	0.6052	***	0.7692	***	-0.4806
	***	(12.8160)	***	(6.7885)	***	(-2.1100)
$\overline{R}^2$	0.6258	0.7561	0.6717	0.7008	0.8986	0.8862
Implied β	0.2376	0.4739	0.2322	No convergence	0.8359	0.3743
			RESTRICTED			
ln ($y_{i,t-1}$)	0.3153*	0.0844**	0.3290*	-0.0864	0.3183**	0.0569
	(3.6333)	(1.7092)	(4.6611)	(-0.8385)	(4.1392)	(0.4453)
ln (ind-share) -ln (n+g+ δ)	0.2006*	0.0657*	0.1382*	0.0717*	-0.1209	-0.0035
	(8.2279)	(4.8557)	(7.9002)	(5.9968)	(-0.3296)	(-0.0435)
ln (MYOS)	***	0.6077*	***	0.7006*	***	0.4291*
	***	(17.0945)	***	(7.9008)	***	(2.7412)
$\overline{R}^2$	0.6320	0.7592	0.6759	0.7038	0.8351	0.8495
Implied β	0.2309	0.4944	0.2223	No convergence	0.2289	0.5732
Implied α	0.2265	0.0669	0.1707	0.0619	-0.2157	-0.0037
Implied φ	***	0.6194	***	0.6049	***	0.4566
Wald Test for restriction:						
F-statistic	0.1445	0.7552	0.2425	1.6073	56.0239	33.7922
p-value	0.7049	0.3876	0.6242	0.2098	0.0000	0.0000

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+s) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645).

Table XI
Fixed Effects Panel Regression for GAP Provinces

Dependent Variable ln (y_t)	1975-2000	1975-2000	1980-2000	1980-2000	1990-2000	1990-2000
UNRESTRICTED						
ln ($y_{i,t-1}$)	-0.2522*	-0.2019*	-0.0039	-0.2411	0.1552*	0.0772
	(-3.0805)	(-2.2053)	(-0.0306)	(-1.5625)	(10.2706)	(0.8705)
ln (ind-share)	0.4482*	0.2723*	0.3042*	0.2575*	0.3773*	0.3779*
	(14.1368)	(6.7025)	(6.6309)	(4.5806)	(10.2365)	(6.2512)
ln (n+g+ δ)	-0.0445	-0.0604*	-0.0676	-0.0788**	0.3877*	-0.3478
	(-1.1543)	(-3.6634)	(-1.3208)	(-2.0251)	(7.1766)	(-0.4109)
ln (MYOS)	***	0.4153*	***	0.4933*	***	0.4335*
	***	(9.1505)	***	(4.2722)	***	(0.9042)
$\overline{R}^2$	0.7025	0.7701	0.7001	0.7214	0.9777	0.9708
Implied β	No convergence	No convergence	No convergence	No convergence	0.3726	0.5121
RESTRICTED						
ln ($y_{i,t-1}$)	-0.0537	-0.1385	0.0742	-0.2209	0.2246*	0.0741*
	(-0.3565)	(-1.5782)	(0.5055)	(-1.2771)	(25.7256)	(2.8705)
ln (ind-share) -ln (n+g+ δ)	0.2900*	0.1349*	0.2114*	0.1491*	0.1312*	0.3775*
	(5.2556)	(4.9271)	(5.7404)	(4.5042)	(21.9605)	(7.6326)
ln (MYOS)	***	0.5864*	***	0.6654*	***	0.4509*
	***	(7.2197)	***	(3.9331)	***	(5.5609)
$\overline{R}^2$	0.6730	0.7821	0.7229	0.7554	0.9443	0.9806
Implied β	No convergence	No convergence	0.5202	No convergence	0.2987	0.5204
Implied α	0.2158	0.1059	0.1859	0.1088	0.1447	0.2896
Implied φ	***	0.4605	***	0.4857	***	0.3460
Wald Test for restriction:						
F-statistic	47.6381	17.3886	8.1335	4.6966	1261.4460	0.0011
p-value	0.0000	0.0003	0.0095	0.0425	0.0000	0.9739

NOTE- t-ratios based on heteroskedasticity-consistent errors are in parentheses. y(t) is GDP per labor force in year t. The industrial share and labor force growth rates are averages for the period t and t-1. MYOS is the average of the mean years of schooling of the labor force for the period t and t-1. (g+ δ) is 0.05 by assumption. While coefficients with a (*) are significant at 0.05 level (t-statistic=1.96), those with a (**) are significant at 0.10 level (t-statistic=1.645) for the 1975-2000 period. t-statistics are 2.069 and 1,714 for 0.05 and 0.10 level of significance for the 1980-2000 period. t-statistics are 2.201 and 1,796 for 0.05 and 0.10 level of significance for the 1990-2000 period.

END NOTES

[1]In Turkey, Human Development Reports have been published each year since 1992 for UNDP. In this study we used HDR (1997) and HDR (2001) to explain the development gap between provinces in Turkey.

[2] GAP refers to the Southeastern Anatolia Project

[3]While determining the most developed and developed provinces, we used HDI (1997) in HDR Turkey. Since the number of provinces in GAP region is nine, we include only ten of the most developed and ten of the developed provinces in the sample to obtain a balanced data and to compare the most developed and developed provinces to GAP provinces.

[4]A simple model of endogenous growth is represented in Lucas (1988), Romer (1986), Rebelo (1991) by the equation Y=AK where Y is the output, A is the expression of factors that affect the technology and K is the broad view of capital which includes both physical and human capital.

[5]The social capability concept here refers to technical competence of a country that may be approximated by years of education and political, commercial, industrial, and financial institutions of that country characterized in a more qualitative way.

[6]These countries are as follows: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, United Kingdom, and United States.

[7]Abramovitz (1986), p.393 and 394.

[8]The same countries as in Abramovitz (1986).

[9]Angus Maddison's data set consist of the levels and growth of labor productivity of 16 industrialized countries dating from 1870 to 1979.

[10]The growth rate is computed by $r=(lny_t-lny_0)/t$

[11]The periods are 1880-1900, 1900-1920, ten years interval from 1920 to 1980, and 1980-1988.

[12]These variables are primary and secondary enrollment rates in 1960, the average ratio of government consumption expenditure to GDP, proxies for political stability, and a measure of market distortions.

[13]The traditional Solow model of growth is improved by including a human capital variable in the Cobb Douglas production function, which is measured by secondary enrollment rate.

[14]The sectors under consideration are manufacturing, construction, domestic trade, transportation / public utilities, financial institutions and services.

[15] SPO, First 5-year Development Plan, p.271, 629, 632-637; Third 5-year Development Plan, p.112, 900; Fourth 5-year Development Plan, p.292, 653-654, 667-668; Fifth 5-year Development Plan, p. 1202; Sixth 5-year Development Plan, p. 1-2, 48, 185-187, Seventh 5-year Development Plan, p. 16, 145-147.

[16]Mutlu, Servet (2000), Doğu Sorunun Kökenleri: Ekonomik Açıdan, p. 406.

[17]Mutlu, Servet (2000), Doğu Sorunun Kökenleri: Ekonomik Açıdan, p. 409-410.

[18]Official web site of GAP Regional Development Administration. Available at www.gap.gov.tr

[19]They are Adıyaman, Batman, Diyarbakır, Gaziantep, Kilis, Mardin, Siirt, Şanlıurfa, Şırnak.

[20]The numbers above were taken from "İllerin ve Bölgelerin Sosyo-Ekonomik Gelişmişlik Sıralaması Araştırması (2003)" by SPO.

[21]The calculation method is provided in Section 4.

[22]See Appendix I and Section 1 for the details of report and calculation of HDI.

[23] See Appendix I for HDI rankings of the provinces in Turkey.

[24]Since the provinces of Batman and Şırnak were the districts of Siirt until the 1990s we assume GDP per labor force figures for Batman, Şırnak, Siirt together although the provinces of Batman and Şırnak also took land from the provinces of Hakkari, Mardin, and Siirt. Even though the validity of the assumption is questionable, how much of the income coming from Batman and Şırnak is obtained from the land taken from Mardin and Hakkari is also questionable.

[25]The data is available at www.die.gov.tr

[26]I am grateful to Erdoğan Özötün for his suggestions in obtaining GDP by provinces at 1987 constant prices.

[27]Güngör and Tansel (1997), p. 5

[28]The formulas for the growth rates and projections for the labor force of provinces were taken from the official web site of DIE available at www.die.gov.tr and from State Institute of Statistics (1995), The Population of Turkey, 1923-1994 Demographic Structure and Development, DIE Prime Ministry Republic of Turkey.

[29]Sala-i Martin (1996), p. 1328.

[30]See Section 4 for a detailed explanation of the selection of provinces.
[31]The same problematic results concerning the role of human capital variable in the growth process are also seen in our pooled and fixed effects panel regressions.
[32]Islam (1995), p. 1153.
[33]The exogenous variables are the logs of initial income, industrial share, MYOS, $n+g+\delta$ of each province for the five-year time periods between 1975-2000.
[34]In the restricted regressions, the coefficient on $\ln(ind-share)$ is equated to the negative of that on $\ln(n+g+\delta)$. The F-statistic and p-value of Wald Test for restriction are given in the last two lines of the tables involving pooled and fixed effects panel estimations.

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