REGIONAL INCOME GROWTH DISPARITIES AND CONVERGENCE IN TURKEY: ANALYZING THE ROLE OF HUMAN CAPITAL DIFFERENCES

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ABSTRACT

REGIONAL INCOME GROWTH DISPARITIES AND CONVERGENCE IN TURKEY: ANALYZING THE ROLE OF HUMAN CAPITAL DIFFERENCES

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The aim of this thesis is to analyze the growth performances of regions in Turkey and the role of human capital in this process within the framework of new growth theory. For this aim, it firstly attempts to investigate the evolution of regional income growth differences in Turkey in the period 1980-2000 and the tendency of provinces in Turkey towards income growth convergence. Secondly, by taking a detailed account of human capital, it aims to explore the contribution of human capital differences towards explaining income growth disparities among Turkey's provinces. In this framework, human capital is defined in terms of education, entrepreneurship and innovation.

Keywords: regional income growth disparities, regional income convergence, human capital, education, entrepreneurship, innovation

ÖZ

TÜRKİYE'DE BÖLGESEL GELİR BÜYÜMESİ FARKLILIKLARI VE YAKINSAMASI: İNSAN SERMAYESİ FARKLILIKLARININ ETKİSİ ÜZERİNE BİR ANALİZ

SARAL, Güldem

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Bu çalışmanın amacı, Türkiye'de bölgelerin büyüme performanslarını ve bu süreçte insan sermayesinin rolünü, yeni büyüme kuramı çerçevesinde incelemektir. Bu amaçla çalışma ilk olarak, Türkiye'de bölgesel gelir büyümelerindeki farklılıkların 1980-2000 döneminde nasıl evrildiğini ve illerin gelir büyümelerinin yakınsama eğilimlerini incelemeye çalışmaktadır. İkinci olarak, insan sermayesini daha detaylı tanımlayarak, insan sermayesi farklılıklarının, Türkiye'nin illeri arasında gelir büyümesindeki farklılıkları açıklamaktaki katkısını araştırmaya çalışmaktadır. Bu çerçevede, insan sermayesi eğitimin yanısıra, girişimcilik ve buluşçuluk kavramları üzerinden tanımlanmıştır.

Anahtar Kelimeler: bölgesel gelir büyümesi farklılıkları, bölgesel gelir yakınsaması, insan sermayesi, eğitim, girişimcilik, yenilik

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CHAPTER 1

INTRODUCTION

Economic growth has been the key issue in the literature since the Second World War. Beginning with Solow's first growth model (1956), the primary focus of this wide debate has been the tendencies of economies towards convergence and the role of different factors explaining this process. Most usually, technological advance or human capital has been emphasized as the major driving force behind economic growth.

Until late 1980s, the aggregate growth of a country was formulated as a function of capital, labor and technology. This formulation first advanced formally by Solow in 1956 started with the idea that technology or knowledge was a free good, accessible for everybody. The model assumed perfect competition, constant returns to scale and diminishing returns to factors of production (capital and labor) and derived the key result that per capita income in all countries would grow at the same, exogenously determined rate of technology (Fagerberg, 1994)[1]. Subsequently, the model suggested that countries with relatively smaller initial levels of capital stock would grow faster than richer ones and that in the long-run per capita income of all countries would converge to a steady state level, at which no growth takes place. The result was that growth differences would be eliminated in the long-run.

[1] Solow introduced diminishing returns to factors of production but the addition of technology, although determined exogenously, drives economic growth.

Obviously, what the neo classical model suggested was not sufficient to explain the developments observed in the world economy. Evidence showed that there was a tendency for growth rates to increase continuously without any decline and the only explanation offered by the Solow model for countries which indicated long-term growth was technological improvement, rate of savings and population growth, the sources of which were left unexplained by the theory.

On the other hand, the prediction of the model that income per capita across countries was converging was proved to be unrealistic. The cross-country evidence (Barro and Sala-I Martin, 1995; Romer, 1986) showed that some nations failed to grow at the same long-term rate and that in countries whose per capita output converged; the speed of convergence was not as fast as predicted by the model. Hence, the model is criticized because of its inability to explain cross-country growth differences and the determinants of technological advance, which were defined as the main source of economic growth.

In the late 1980s, the premises of the traditional neoclassical growth theory were reformulated by some economists (Romer, 1986; Lucas, 1988) by taking endogenous sources of growth[2] into account (Amable, 1994)[3]. Accepting the assumption of the Solow model on perfect competition, the *new growth theory (endogenous growth theory)* emphasized knowledge externalities and knowledge spillovers as the main factors behind economic growth. Spillovers of knowledge and knowledge externalities entered into the model because of the acknowledgement that knowledge could be accessed by others at zero cost (non-rivalry) and its use by others could not be protected completely (partial-excludability). The model defined human capital as an important part of the process of knowledge accumulation and research and development and suggested a broadly defined capital accumulation, which included human capital, as the crucial determinant of sustained growth.

[2] To endogenize factors of growth refers to the acknowledgement that there are factors generated by the economy itself that affect its growth (Karlsson, Johansson and Stough, 2001).
[3] The model offered by these economists is regarded as an extension of Arrow's (1962) learning-by-doing model. This model recognized that knowledge produced through learning-by-doing was non-rival but took it as exogenously given, and did not acknowledge intentional investments in research and development (Romer, 1990).

The recognition of knowledge externalities and spillover effects and the inclusion of human capital as an endogenous source of economic growth in these models led to the elimination of diminishing returns to capital assumed by the neo classical growth model. Subsequently, the model predicted constant or increasing returns to scale and thus increasing differences of growth rates (Keilbach, 2000). As opposed to the neoclassical prediction of convergence, it was concluded that economies would not converge to a steady state level but rather to different steady states since there might be differences in terms of their basic initial conditions.

Beginning from the early models of Romer and Lucas, endogenous growth model has improved a lot. More recent models have acknowledged the creation of new knowledge to eliminate the assumption of diminishing returns and a research and development sector which specialized in the production of new knowledge (Aghion and Howitt, 1992; Grossman and Helpman, 1990, 1991a, b; Romer, 1990). These models saw the creation of new knowledge as the source of economic growth. The basic idea behind these models was the recognition that the market for ideas was not perfect because of the actors in the market tended to invest in innovation activities intentionally in order to get monopoly profits. Therefore, the existence of monopoly profits introduced imperfect competition to endogenous growth models and further led to the study of technological diffusion from the leader to the follower economies through international trade. These models highlighted technology diffusion as a process, which led to catch-up and human capital was put at the center of this debate as a factor, which facilitated the imitation of technology. Later models embodied the life-cycle aspect of innovation and emphasized the process of creative destruction in their view of economic growth. The acknowledgement of monopoly profits, technological diffusion through international trade and creative destruction in the more recent models of endogenous growth, obviously implied the likelihood of divergence among different economies.

This emphasis on economic growth as an endogenous process has stimulated the attention on trends of countries or regions towards convergence or

divergence but with a renewed emphasis on some endogenized factors explaining economic growth. There appeared a huge number of empirical studies, which were directed to present evidence on the capacity of new growth models to explain the process of convergence (Abramovitz, 1994; Barro and Sala-I Martin, 1992; Cuadrado-Roura, 2001; Mankiw et al., 1992; Terrasi, 1999), referring to different countries of the world, the European Union or regions of various countries. Based on the two measures of convergence, namely sigma and beta convergence, they attempted to investigate whether the dispersion of income tended to fall over time (sigma convergence) and to evaluate whether poor economies tended to grow faster than richer ones (beta convergence). As opposed to the neoclassical prediction of convergence, it was concluded that economies would not converge to a steady state level but rather to different steady states since they differed in their basic initial conditions such as human capital, population growth, savings rate, etc., implying conditional convergence. Although different factors were emphasized to affect economic growth, most of these studies have put emphasis on human capital as a proxy of knowledge to explain cross-country growth differences and trends of growth convergence and usually used formal education or schooling as indicators of human capital (Barro, 1991; Barro, 1997; Barro and Sala-I Martin, 1995; Benhabib and Spiegel, 1994; Gemmel, 1996).

To sum up, the process of economic growth has attracted wide attention since the 1980s with endogenous growth models. Convergence hypothesis has been the major issue to test growth differences and human capital has been emphasized as the prominent source of this process. This thesis is a contribution to this wide array of empirical studies within the framework of endogenous growth theory, with its aim to analyze the growth performances of regions in Turkey. It attempts, firstly, to investigate the evolution of regional income growth differences in Turkey in the period 1980-2000 and secondly, to explore the contribution of human capital differences towards explaining income growth disparities among Turkey's provinces by taking a detailed account of human capital. Human capital is defined in terms of innovation and entrepreneurship besides education.

The thesis is divided into five chapters. Apart from this introduction, the second chapter attempts to give an overview of endogenous growth theory and discusses the main issues surrounding them. After a review of different models of endogenous growth, the chapter focuses on their implications for growth rate differentials. This is discussed first in terms of the convergence hypothesis and second in terms of the causes of growth rate differences. While doing this, the chapter presents findings from different empirical studies about these issues.

Beginning with chapter three is a specific examination of the Turkish case on the basis of regional income growth convergence and factors explaining this trend in terms of human capital. The third chapter is dedicated to address the main features of the evolution of regional income growth in Turkey beginning from the 1980s and intends to provide the background for the subsequent chapters. After identifying the main contours of income growth differences in Turkey and relating this to her growth experience, the chapter provides a detailed account of regional income differences since the 1980s. It presents evidence about sigma convergence of income growth among provinces in Turkey and evaluates the findings.

Chapter four investigates, in detail, the causes of regional income differences by focusing on different components of human capital. Defining human capital in terms of innovation and entrepreneurship, besides education, this chapter attempts to find out to what extent human capital differences contribute to explaining regional income growth convergence in Turkey. It starts with an examination of the relationship between regional income differences at the beginning of the period of analysis and income growth differences between 1980 and 2000. This is followed by a detailed discussion of human capital differences among provinces of Turkey and its relation with income growth differences. After this discussion, findings of conditional beta convergence analysis are presented and evaluated.

The fifth chapter, consequently, synthesizes the most interesting aspects of regional income differentials in Turkey in the period 1980-2000 and the role of human capital differences in explaining this process. Based on these findings,

the chapter points to the role of schooling as the basic component of human capital on explaining income growth differences and discusses its repercussions for regional policy. It argues on the necessity for regional policies that take into consideration the role of human capital to eliminate income growth differences, especially for the lagging regions. On the other hand, based on the evaluation of other findings, the chapter identifies some problems related with the convergence model and lastly, raises some questions for further study.

CHAPTER 2

THEORIES OF ENDOGENOUS GROWTH

2.1 Models of Endogenous Growth Theory

Although technological improvement was seen as the only way to long-run growth, traditional models of growth left it unexplained by taking it as exogenously given in the growth process. It was with endogenous growth models that technological change or human capital has been integrated in theories of economic growth. Yet, in spite of integrating human capital as a factor of growth, the endogenous growth models at the beginning still involved the suggestions and premises of the neoclassical growth model. Starting with Romer's model in the 1980s, new growth theories recognized knowledge externalities and spillover effects in the in the growth equation and predicted non-diminishing returns to scale. From the 1980s on, the framework of new growth theories has indicated considerable changes. The following models of endogenous growth included intentional research and development investments and the diffusion of technology in the growth equation (Table 2.1). All of these models have provided a diversity of determinants of economic growth, which played critical roles for policy interventions on economic growth especially for the least developed economies.

2.1.1 Endogenous Spillover Models

First attempt to endogenize sources of growth and to tackle the deficiencies of the neoclassical model was offered by Romer (1986). The focus of Romer's

Table 2.1 A Summary of Endogenous Growth Models

Type of Growth Theory	Example	Characteristics	Endogenization of Technological Change	Implications
Augmented neoclassical model	Mankiw, Romer and Weil, 1992	-perfect competition -physical as well as human capital -diminishing returns to capital	-exogenous technological progress	-convergence at a slower rate -competitive equilibrium
Endogenous growth model with knowledge spillovers	Romer, 1986	-perfect competition -increasing returns to capital -decreasing returns in the production of new knowledge -increasing returns to growth	-externalities from the stock of knowledge -spillovers of knowledge	-possibility of divergence -competitive equilibrium -policy measures are important in economic growth
Endogenous intentional human capital model	Lucas, 1988 Jones and Manuelli, 1988 King and Rebelo, 1990	-perfect competition -constant returns to capital -constant returns to growth -intentional investment in education	-externalities from the accumulation of human capital (through its internal and external effects on growth) -spillovers from education and training	-competitive equilibrium -government subsidy is important to internalize external effects of human capital on growth

Source: Author's own elaboration

Table 2.1 Summary of Endogenous Growth Models (continued)

Type of Growth Theory	**Example**	**Characteristics**	**Endogenization of Technological Change**	**Implications**
Schumpeterian endogenous innovation models	Romer, 1990	-increasing returns to growth -intentional investment in technology and innovation by profit-seeking producers -temporary monopoly power as the major motivator of innovation process	-research and development sector and human capital accumulation	-partial excludability of knowledge -imperfect (monopolistic) competition -no convergence -governmental actions are important tools for long-run growth
Schumpeterian endogenous growth model with technological diffusion	Grossman and Helpman, 1989, 1990 Benhabib and Spiegel, 1994 Barro and Sala-i Martin, 1995 Aghion and Howitt, 1992	-technological diffusion and imitation -international trade facilitates imitation -human capital facilitates the implementation of new technology and the creation of new knowledge	-knowledge spillovers from research and development	-possibility of conditional convergence through imitation and diffusion of technology
Product quality models of endogenous growth	Grossman and Helpman, 1991 Aghion and Howitt, 1992	-constant or increasing returns to growth -life-cycle aspect of innovation -creative destruction	-innovation and research	-monopolistic competition

Source: Author's own elaboration

model was on knowledge as the basic form of capital, which was assumed a product of research technology. In other words, "given the stock of knowledge at a point, doubling the inputs into research will double the amount of new knowledge produced" (Romer, 1986: 1003). Following this assumption was a model of endogenous technology in which long-run growth was driven by the accumulation of knowledge by perfectly rational, profit maximizing agents (Romer, 1986).

The most important point of the model is its recognition of externalities and spillover effects. The model showed that capital investment (which includes human capital) generates externalities of learning-by-doing and spillovers (Martin and Sunley, 1998). This idea suggests that 'a firm can learn how to build a new product or improve its production process by observing the activities of other firms' (Rebelo, 1998: 10). Spillovers, which underlie the diffusion process of knowledge, foster this process. Therefore, firms gain advantages not only because of investing in the stock of knowledge but also from the knowledge other firms acquire (Button, 2000). It is through these externalities that knowledge becomes a public good and technological progress is endogenized in the model (Martin and Sunley, 1998).

The existence of knowledge externalities and spillovers in the model introduces non-diminishing returns to capital. Since returns to broadly defined capital, need not diminish as growth takes place, it is possible to observe indefinite growth (Barro, 1997). The result is increasing returns in the production of output (Romer, 1986).

With the introduction of externalities, increasing returns to scale, and decreasing returns in the production of new knowledge, the model attempted to explain the cross-country differences of output growth. It underlies the possibility that less developed economies have slower growth rates and are in a disadvantaged position in the growth process (Shaw, 1992). This possibility implies the widening of the gap between the growth rates of less developed and developed economies.

2.1.2 Human Capital Models of Endogenous Growth

Although Romer's model with broad capital introduces the existence of externalities as an important factor in the growth process, it ignores the intentional (deliberate) investment in education and research and development (Martin and Sunley, 1998). The endogenous intentional human capital model, first proposed by Lucas (1988) recognizes intentional investment in education.

Like Romer's model, the model of endogenous growth advanced by Lucas (1988) recognizes endogenous technology, human capital as a factor of production and non-diminishing returns to capital due to externalities and external effects of knowledge, but there is an important difference between their models. Romer focused on the stock of knowledge as the basic source of externality, emphasized both human capital and the stock of knowledge as factors influencing the growth of knowledge, and suggested increasing returns to capital and to the production of output. However, Lucas's model suggests constant returns to capital and rates of growth and the main source of externalities is the accumulation of human capital.

Lucas distinguished between internal and external effects of human capital accumulation on growth, which were defined as the source of positive externalities related to the accumulation of human capital (Amable, 1994). Accumulation of human capital has internal effect on growth by raising the productivity of labor. This is the result of the assumption that the average skill level of a group of people affects the productivity of each individual within the system (Lucas, 1988). In other words, higher the average level of human capital leads to higher productivity of each worker. On the other hand, the external effect comes to the foreground when human capital accumulation raises the productivity of physical capital, and the increase in productivity contributes to per capita income growth (Gemmel, 1998; Schultz, 1993; Benhabib and Spiegel, 1994). The result is that higher initial levels of human and physical capital lead to a higher rate of growth.

In addition to this differentiation between internal and external effects of human capital accumulation, the model recognized that 'the production of human capital generates a non-rival and non-excludable good' (Shaw, 1992: 617)[1]. This assumption is because knowledge is recognized as a public good that its use by one firm does not limit its use by other firms and because it is not possible to protect the use of knowledge by others. Introducing partial-excludability accounts for investments in research and development sector by profit-maximizing producers.

These definitions have important implications in terms of policy. The existence of benefits from R&D investments, which are available for everyone, necessitates public subsidies to research and human capital. Lucas points to the importance of policies that involve subsidies to education to internalize the external effects in order to raise the rate of growth. The internalization of external effects is important since external effects decrease the competitive rate of growth (Cabelle, 1995) and of government subsidy to research, which are important for the accumulation of capital (Rebelo, 1998; Shaw, 1992).

Following Lucas's argument that 'capital accumulation which includes human capital as the driving force behind economic growth' (Grossman and Helpman, 1994: 23), King and Rebelo (1990) searched for the role of government policies to explain cross country differences in long-term rates of growth and concluded that public policies have a large influence on rates of growth of economies since they influence private incentives to accumulate both physical and human capital.

2.1.3 Schumpeterian Innovation Models

Following these initial models of endogenous growth, there are attempts in the 1990s to endogenize technological innovation as a source of endogenous growth (Aghion and Howitt, 1992; Barro and Sala-i Martin, 1995; Grossman

[1] 'Non-rivalry' implies that the use of one good does not limit its use by others, while 'non-exludability' refers that the use of one good cannot be prevented from being used by others.

and Helpman, 1991; Romer, 1990). These studies are directed to explain the origin of technological change by endogenizing the process of technological improvement (Barro and Sala-i Martin, 1995).

The most important feature of these models is the acknowledgement of a research and development sector specialized in the production of new knowledge (Shaw, 1992). Research and development activities are emphasized to offset the tendency of diminishing returns to capital and contribute to our understanding of the relation between R&D and growth (Pack, 1994).

Following Schumpeter's stress on temporary monopoly power as the motivator of innovation activities, endogenous innovation models recognize intentional and purposive investment in technology and innovation and emphasize the role of profit-seeking producers who increase returns to technological improvements (Barro and Sala-I Martin, 1995; Martin and Sunley, 1998). Such recognition lets them 'to think of firms as undertaking investments aimed at producing new products and production methods' (Rebelo, 1998: 18). The reason why firms invest in research and development is because of imperfect competition through which firms earn monopoly profits from new products. This implies the contribution of the private sector to technological activities (Romer, 1990). Romer (1990) argued that firms tend to invest in new knowledge because they gain a temporary monopoly profit in return for the cost of the production of new knowledge. Such a suggestion in the model implies that knowledge is not treated as a completely public good any more. However, the non-rival technological component of knowledge is also recognized, which gives way to the existence of knowledge spillovers in the model (Shaw, 1992) and eliminates decreasing or constant returns to scale.

Based on this differentiation between the non-rival and rival components of knowledge, Romer makes a distinction between human capital and technology. Technology, defined as the design of a new good, is non-rival because it is usually the result of research and development activities of private firms and once created it is used extensively that everyone takes advantage of it (Romer,

1990). Different from the design of a new good, human capital is rival since abilities are tied to one person and cannot be used by others.

The basic departure point of endogenous innovation models from models based on the accumulation of human capital is their recognition of partial excludability (Barro and Sala-i Martin, 1995). Romer (1990) defined partial excludability based on his distinction between non-rival technology and rival human capital. In his model, knowledge enters into production in one direct and one indirect way. First, a new design can be used directly to produce output, and second, through increasing the total stock of knowledge, it increases the productivity of human capital devoted to research. Romer adds that, while the direct benefit of knowledge to productivity is excludable, its indirect benefit is non-excludable. He concluded that, the design of a new good with a non-rival nature is partially excludable. 'The owner of a new idea has certain property rights over its use in the production of a new producer but not over its use in research' (Shaw, 1992: 616). Through the legal decisions, such as patenting, which prevent the good from being copied, etc. a non-excludable good, which cannot be prevented from being used by others, can be made excludable. Thus, 'knowledge is a non-rival good that is partially excludable and privately provided' (Romer, 1990: s85). The recognition of partial excludability implies the allowance for intentional private investments in research and development (Ochoa, 1996), for monopolistic competition.

In terms of growth, Romer's argument is based on the premise that growth is the direct result of human capital accumulation, the basic driver of which is technological change. Although in his previous models he recognized the importance of human capital in research process, he did not emphasize human capital as the determinant of growth until this model. The introduction of new goods increases productivity and leads to growth. Human capital plays an important role in the generation of growth because of its role in the creation, implementation and adaptation of new technologies or ideas (Benhabib and Spiegel, 1994).

The model suggests that the *level* of human capital has both direct and indirect effect on growth (Benhabib and Spiegel, 1994). It directly affects productivity because of its effect on the capacity of nations to innovate and indirectly influences the growth process by affecting the speed of the catch-up process (Benhabib and Spiegel, 1994). In other words, the greater the initial stocks of human capital, the greater the capacity of a nation to innovate and thereby the greater the physical capital investment and the faster the nation tends to grow (Barro, 1991; Gemmel, 1996). Thus, the reason, he argues, why growth is not observed in the underdeveloped economies of the world and why an underdeveloped economy with a large population does not exhibit a good economic performance is their low levels of human capital.

Since endogenous innovation models are based on the idea of imperfect competition, they introduce policies as important tools in fostering technological development effectively. Romer's (1990) model suggests that governmental actions-by providing infrastructure, laws and regulations of international trade, financial markets, property rights and taxation-as well as patents and R&D funding-to protect innovative firms-play important roles on the long run growth rate (Barro and Sala-i Martin, 1995; Barro, 1997; Button, 2000).

2.1.4 International Trade Models of Endogenous Growth

More recent models of endogenous innovation study the diffusion of the technological progress (Aghion and Howitt, 1992; Grossman and Helpman, 1990, 1991a, b). The essential issue in these models is the speed of diffusion of innovations from leading to follower economies. The reason they emphasize why rapid growth takes place is not only because of access to new ideas but also of the diffusion of these ideas (Romer, 1994). Therefore, it is because of the different capabilities of countries to reach, apply, implement and adapt themselves to new ideas that rates of growth differ across countries. They argue that, since imitation is cheaper than innovation, as far as follower countries

imitate and adapt the new ideas created in leader countries relatively quickly, conditional convergence takes place.

Grossman and Helpman (1990) defined innovation and imitation as the two forms of learning which lead to technological progress where innovation is 'the creation of new processes and products' and imitation helps new ideas percolate through the economy. International trade is important because it facilitates the imitation process. They examined the role of international trade on the growth performance of countries and emphasized the role of human capital because of its role on 'new, non-traded, intermediate products' (Grossman and Helpman, 1990: 89).

Their results indicated that promoting human capital-intensive final products by trade protection policies has negative effect on long run growth, while the promotion of labor-intensive goods has a positive effect. This is because, they argue, human capital-intensive manufacturing becomes a substitute for the research and development sector and the skilled labor shifts from the latter to the former. Shortly, their models emphasize the importance of international relationships for less developed countries because of the greater extent of their gains from the stock of knowledge accumulated in the developed ones (Grossman and Helpman, 1990).

Benhabib and Spiegel (1994) based their model on the spread of new technologies or ideas across countries (Barro, 1991). They recognized the diffusion of technology across countries, which allowed for catch-up. They argued that the level of human capital increases the ability of one country to develop technological innovations on one hand, and on the other, it increases its ability to adapt technologies developed in other countries. The result is that because of the catch-up effect, higher levels of human capital lead to higher rates of growth.

This argument obviously implies that it is possible for a country with higher level of human capital to overtake the leader country with the highest initial level of technology and be the leader in the future if it does not lose its human

capital advantage. Thus, human capital is important not only because of entering as an important factor in the production but also because it facilitates the implementation of technology created elsewhere and the creation of domestic technological innovations (Benhabib and Spiegel, 1994). In addition to this, following Lucas (1990), they recognized the role of human capital on growth by encouraging the accumulation of physical capital. They concluded that human capital is also important to contribute to growth since it attracts physical capital.

2.1.5 Product Quality Models of Endogenous Growth

Some other models of endogenous growth offer a different view of innovation, which consists of 'creative destruction'. It is recognized that the introduction of each innovation takes place of the previous one and eliminates the monopoly power on it.

In their following studies Grossman and Helpman (1991a, b) embody 'the life cycle aspect of innovation' (Rebelo, 1998: 26), which introduced that the production of old goods stop as new goods are produced. In their model, they combined theories of quality ladders and product life cycles. When a country introduces a product, it takes time for that product to be imitated by the follower. Follower countries produce the imitated product for some time before being improved by the leader. These improvements of products by the leaders improve the quality of the product. The result is that recently introduced products stay above the quality ladder and the variants of which become obsolete stay below (Grossman and Helpman, 1991b). Therefore, every product has a place on the quality ladder and has a life cycle.

Similarly, Aghion and Howitt (1992) examined innovations, which improve the quality of products. They launched the idea that rents that are captured from patenting a successful innovation will be destroyed and made obsolete by the next innovation, which makes the previous one obsolete (Aghion and Howitt, 1992). Their model emphasized the process of creative destruction of

Schumpeter. The result is that progress or improvement creates a new product but destroys the old one.

When the very recent models proposed by Grossman and Helpman (1991a, b) and Aghion and Howitt (1992) are compared with the early models of endogenous growth and even with the traditional model of Solow, it is obviously seen that the framework of theories of economic growth has indicated considerable changes from the 1960s to 1980s and 1990s. Although technological improvement was seen as the only way to long-run growth, it remained unexplained until the endogenous growth models of the 1980s. It was with endogenous growth models that human capital is integrated in theories of economic growth and technological change. In spite of integrating human capital as a factor of growth, the endogenous growth models at the beginning still involved the suggestions and premises of the neoclassical growth model. It was not until the introduction of externalities and knowledge spillovers by later models that the role of increasing returns was recognized and human capital was endogenized in these models.

The inclusion of intentional research and development investments, the diffusion of technology through international trade and the process of creative destruction in innovation in the more recent models, obviously provided a diversity of determinants of economic growth and offered new implications in terms of growth rate differentials, as opposed to the traditional growth theory.

2.2 Implications of Endogenous Growth Theory for Growth Rate Differentials

The endogenous logic for growth rate differentials has shaped empirical studies of the new growth literature. These studies have either centered on the capacity of new growth theories to explain the speed of convergence (Barro and Sala-i Martin, 1995; Barro, 1997; Mankiw et al., 1992; Sala-i Martin, 1996b) or attempted to elucidate the endogenized factors explaining economic growth (Barro, 1991; Barro and Sala-i Martin, 1992; Benhabib and Spiegel, 1994; Gemmel, 1996).

These attempts have given way to a large number of studies on convergence, divergence, catching up and falling behind (Silverberg and Soete, 1994).

2.2.1 The Convergence Debate

The question 'why growth rates differ' was the main concern of the traditional growth literature. The Solow model assumed that all countries of the world are on the same production function, the only difference being in terms of factors of production. Based on this assumption, the model predicted that poor countries grew faster than richer ones and reached an exogenously determined rate of growth.

At the center of the convergence studies of the new growth literature, however, has been the recognition of different returns to capital and subsequently the rejection of the neo classical suggestion that the only reason behind per capita income differences is differences in investment rates, assuming technology as a free good (Amable, 1994). Hence, being aware of the insufficiency of the neo classical model of convergence with one independent variable, new growth theories have included other variables as sources of growth rate differentials and suggested that each economy had different initial conditions and its own growth path and therefore economies did not need to converge to a steady state level in the long run. Therefore, new growth theories pointed to the 'possibility of multiple stable or unstable equilibria' and 'sensitivity to initial conditions' (Nijkamp and Poot, 1998: 25) against the neoclassical notion of equal growth paths and make use of convergence analysis as a tool against the neo classical model, to prove the absence of convergence across economies of the world (Sala-i Martin, 1996a).

The notion of convergence is defined as the decline in per capita income or productivity differences between economies. In other words, the process of convergence indicates that the income or productivity levels of economies become closer to each other and inequalities between economies to disappear in the long run (Cuadrado-Roura et al., 1999; Baumol, Nelson and Wolff, 1994).

Two measures of convergence are offered; namely, weak convergence (beta convergence) and strong convergence (sigma convergence).

The concept of weak convergence (beta convergence) is first launched by Barro (1991) and Barro and Sala-i Martin (1991, 1992). It is a measure to evaluate whether poor economies tend to grow faster than richer ones. *Absolute* weak convergence implies that initially poorer economies tend to grow faster than richer ones and therefore catch up with the latter and reach the same steady state level in the long run. A negative relation between the rate of growth of per capita income and the initial income indicates absolute beta convergence in a cross-section of economies.

However, economies may differ because of the difference of their structural characteristics, such as their propensities to save, levels of technology, population growth rates, institutions, etc. Then, because of these structural differences, each economy will have its own steady state, and not all the economies will reach the same steady state level. In this case, if some structural variables are held constant and initial income is negatively related with per capita income growth, the convergence is said to be conditional on these additional variables (Barro, 1997; Barro and Sala-i Martin, 1992, 1995; Mankiw et al., 1992; Sala-i Martin, 1990). Therefore, *conditional convergence* 'implies convergence after controlling for certain variables that contribute to growth' (Cuadrado-Roura, et al., 1999: 51).

The notion of *strong convergence* (sigma convergence) is first introduced by Sala-i Martin (1990). While beta convergence indicates the mobility of income in a distribution of economies of the world, sigma convergence is related with the evolution of the distribution of income over time (Sala-i Martin, 1996a, b). The existence of sigma convergence indicates that the dispersion of per capita income of economies tends to fall over time (Efthymios, 2000). The existence of beta convergence is defined as a prerequisite for the existence of sigma convergence, meaning that, a negative relation between per capita income or productivity growth and initial income or productivity is necessary for a

decline in the dispersion of per capita income or productivity levels of economies.

Based on these concepts of convergence, there appeared a variety of empirical studies, which have viewed the notion of convergence in two different perspectives. The first group of studies has emphasized the existence of some factors that contribute to faster growth of developed economies, which impede the process of convergence between advanced and poor economies. Some of these studies have analyzed convergence in a cross-section of countries of the world (Barro and Sala-i Martin, 1995; Barro, 1997; Mankiw et al., 1992; Sala-I Martin, 1996a), while others searched for convergence by taking as reference regions of different countries (Barro and Sala-i Martin, 1992; Benvenuti et al., 1999; Cuadrado-Roura et al, 1999; Sala-i Martin, 1996; Terrasi, 1999) or the EU (Cappelen et al., 1999; Chesire and Magrini, 2000; Cuadrado-Roura, 2001; Cuadrado-Roura, et al., 2000). More recent studies on convergence have searched for the impacts of European integration on regional inequalities and highlighted some factors that influenced this process (Amin et al., 1992; Camagni, 1992; Dunford, 1993, 1998).

A second group of empirical studies, on the other hand has centered on advantages of lagging behind and emphasized that poorer economies tended to grow faster than more advanced ones and catch up to the leader economy (Baumol, 1986; Baumol, Blackman and Wolf, 1989; Verspagen, 1994).

2.2.1.1 Cross-Country Convergence

Cross-country analyses have been the widest group of studies on convergence in the endogenous growth literature. Most researchers attempted to test the speed of convergence predicted by the traditional growth model in a cross-section of the countries of the world or industrialized countries (Table 2.2).

To test for the predictions of the neo classical growth model with evidence, Mankiw et al. (1992) offered an augmented Slow model and regressed growth on per capita income, share of investment and human capital. The model was

Table 2.2 A Summary of Empirical Studies of Cross Country Convergence

Author (s)	Sample	Variables	Results
Cross-Country Convergence			
Mankiw et al.,1992	98 non-oil producing countries 75 intermediate countries 22 OECD countries 1960-1985	Secondary school enrollment rates	-Poorer countries tend to converge in the long-run -An augmented Solow model with human capital acumulation can explain cross-countryincome differences
Barro and Sala-i Martin, 1995	97 countries 1965-1985	Female and male educational attainment rates	-Conditional convergence -primary level attainment is not significantly related to growth rates -school attainment variables related to growth rate are: male and female secondary and higher schooling
Barro, 1997	114 countries 1960-1990	-fertility rate -government consumption -political rights -inflation rate -life expectancy at birth -secondary and higher educational attainments for males and females aged 25+	-conditional convergence -male secondary and higher level education is significantly related to growth -female education is not significantly related to growth

Source: Author's own elaboration

tested by aggregate data in a group of countries in the period 1960-1985. The results indicated that countries with similar levels of technology or human capital converged in per capita income levels but that the speed of convergence was slower than the one predicted by the Solow model. This finding suggested that the inclusion of human capital variables in their models, secondary school enrollment rates of the working population, lowered the coefficient on the initial level of income and thus the estimated speed of convergence, which gave a better fit of the regression. Following this result, they concluded that, although countries had different growth paths, an extended Solow model with three variables; rates of saving, population growth and human capital, was sufficient to explain the differences in per capita income levels.

However, in their study in the same period, using an endogenous growth model, Barro and Sala-i Martin (1995) ended up with a different result. They used educational attainment levels as the proxy of human capital and found that average years of male and female schooling are significantly related to rates of growth. Their results pointed out conditional convergence, in that lower initial levels of per capita income resulted with higher growth only if some explanatory variables correlated with per capita income were held constant.

Barro's (1997) analysis of growth across a larger group of countries in the same period took into account the role of some other variables than human capital on growth. While using educational attainment rates for males and females, Barro also considered state variables, choice and environmental variables as factors affecting per capita income, and came up with a similar result with other researchers; that is, conditional convergence.

With a set of 110 countries between 1960 and 1990, Sala-i Martin (1996a) reached similar results. When conditioned on primary and secondary school enrollments, saving rates and some political variables, he found that, rate of growth of economies slowed down and approached a long-run level of income.

Despite some differentiation, studies on cross-country convergence agree on the timing of convergence. The findings demonstrated that the postwar period

indicated an unexpected income or productivity convergence, followed by a decrease in the trend of convergence after 1970s and a trend of decreasing convergence from the mid- 1980s on. In fact, different researchers drew different conclusions regarding the last period. While some suggested a very slow rate of convergence, others demonstrated that it was a period of simultaneous convergence and divergence (Cuadrado-Roura, 2001).

2.2.1.2 Regional Convergence

The idea behind studies of regional convergence is the recognition that steady state levels vary across regions and different regions have different growth paths. These spatial series of studies of convergence have directed attention to per capita income differences and referred to trends of regional convergence/divergence with reference to the states of the United States, regions of various countries as well as the European regions (Cuadrado, 2001) (Table 2.3).

Among the researchers that have analyzed regional convergence, the ones following the neo classical strand have attempted to adapt the concepts and techniques of new growth theory to a regional context (Barro and Sala-i Martin, 1992; Sala-i Martin, 1996a). These studies of regional convergence have analyzed the empirical results in the light of the neo classical model and concluded that regional economies would converge conditionally, although with a very slow rate. With such an argument they, obviously have emphasized the advantage of lagging behind in explaining the convergence of regional per capita income or productivity levels (Cuadrado-Roura et al., 1999).

Sala-i Martin (1996a), for example, studied the regional evidence on conditional convergence in OECD economies, the states of the US, Japanese prefectures, European regions, and other countries over the period 1950-1990. His results indicated conditional convergence with a speed close to two percent per year. However, the findings showed that the process of sigma convergence within most of these economies tended to stop in the mid-1970s.

Table 2.3 A Summary of Empirical Studies of Regional Convergence

Author (s)	Sample	Variables	Results
Regional Convergence			
Sala-i Martin, 1996a	110 countries, 3 sub-samples: OECD countries US states Japanese prefectures 1960-1990	-sectoral incomes -regional dummies	-no cross-country convergence in the period 1960-1990 -OECD countries converge conditionally with a 2% speed but sigma convergence stopped after mid-1970s -other groups of countries display sigma, absolute beta and conditional beta convergence
Barro and Sala-i Martin, 1992	48 US states 1960-1985	-initial school enrollment rates -ratio of government consumption to GDP	-convergence conditioned on initial school enrollment rates and government consumption
Terrasi, 1999	.Italian regions 1953-1993	-regional inequality index -national development index	-different convergence path for two groups of regions; intermediate development regions and least developed regions -regional structure is related to national development
Chatterji and Dewurst, 1996	counties and regions of Great Britain 1977-1991	-	-a richer group of regions exhibited convergence among themselves, while the poorer one diverged from the former club -regions exhibited a tendency towards convergence when national income grew at a slower rate; and divergence in periods of faster national growth

Source: Author's own elaboration

In a similar vein, Barro and Sala-I Martin (1992) studied convergence across 48 US states, including regional dummies and the sectoral composition of the regions. They found convergence across the states of the US conditional on these variables, the rates of which they predicted as around 2 percent per year; in the sense that poorer states of the US tend to grow faster than richer ones in per capita income levels when some determinants of growth were held constant.

Apart from these, researchers from the regional science literature have analyzed regional convergence is different countries. In their analysis of convergence across Italian regions, Terrasi (1999) underlined a long-term process of regional divergence after 1975 and emphasized national development and spatial factors to have played an important role in this process, while Benvenuti et al. (1999) focused on conditional convergence and cast some doubts on theresults of the analyses of regional convergence. The argument of the latter was based on the idea that the use of convergence measures in economies with dualistic structures and subsequently they suggested, for such cases, the use of long-run oriented tools in the analysis of regional disparities.

In line with these works, some studies have attempted to analyze regional convergence at the EU level (Cuadrado-Roura, 2001; Cuadrado-Roura et al., 2000). Most of these analyses indicated a tendency of per capita income convergence within the European Union. However, despite some differences, most of these studies have differentiated between three periods in the evolution of disparities in terms of per capita income or productivity (Cuadrado-Roura, 2001); the period between 1960 and 1970 indicated a period of convergence, although with a rather slow rate of 2 percent per year; from the mid-1970, the trend of income or productivity convergence seems to stop within the EU, even there observed signs of a trend towards divergence. For the period from the mid-1980s to the mid-1990s, although different studies have concluded with differentiated results, it has been agreed that the speed of convergence has decreased extremely in the EU, even with some periods of divergence.

This confusing picture has led to some studies, which have emphasized "the existence of selective tendencies, convergence clubs and asymmetric shocks in various economies" (Petrakos and Saratsis, 2000:58) as causes of the process of divergence and spatial inequalities in the EU (Baumol, 1986; Chatterji and Dewurst, 1996). Chatterji and Dewurst, for example, focused on the possibility of convergence clubs among regions of Great Britain and found evidence that richer group of regions exhibited convergence, while a poorer group diverged from the former. Overall, their results indicated a tendency towards divergence in the period 1977-1991.

Evidences on regional divergence have, more recently, led especially regional scientists, to examine the impact of European integration on regional inequalities (Amin et al., 1992; Camagni, 1992; Dunford, 1993, 1994). In their attempt to search for the consequences of EU regional policies on lagging regions, they found evidence that European integration would lead to increases in regional disparities and pointed to the need for new regional policy interventions and their spatial implications to integrate these areas in the EU.

2.2.1.3 Catch-Up

The hypothesis that poor economies grow faster than richer ones and show a tendency to converge in the long run has given way to another aspect of convergence; namely *catch-up* (Baumol, 1986; Baumol, Blackman and Wolf, 1988; Verspagen, 1994). It is measured by the relative differences between the income levels of particular economies and that of the leader economy (Abramovitz, 1994). A tendency for catch-up implies a tendency for the laggard economy to reduce the distance between its level of income and the income level of the leading economy (Baumol, Nelson and Wolf, 1994).

Most of the studies in the catch-up literature look at the catching-up issue among industrialized or OECD countries (Abramovitz, 1994; Baumol, Blackman and Wolff, 1989). These studies generally find negative correlation between growth rates and initial per capita income a result, which implies catching-up (Table 2.4).

Table 2.4 A Summary of Empirical Studies of Catch-Up

Author (s)	Sample	Variables	Results
Catch-up			
Baumol, 1986	İndustrialized countries Socialist countries Developing countries	-	-convergence is not a global trend, there are some poor countries, which continue to grow the most slowly
Baumol et al., 1989	7 industrialized countries, 1870-1979 11 industrialized countries, 1830-1913 124 countries,1965-1985	Education variables	-convergence among a group of advanced countries -divergence in the early industrialization period -convergence is not a global process; but there are some poor countries that continue to grow the most slowly -countries with similar levels of human capital tend to converge among themselves
Verspagen, 1994	OECD countries, 1970-1985	-technology related factors (R&D and patent stocks, disembodied knowledge spillovers) -knowledge spillovers embodied in technology payments or imports of capital and intermediate goods	-post-war period is characterized by income convergence until 1980 -technology rrelated factors are significantly related with growth convergence -embodied knowledge spillovers are not significant in determining growth

Source: Author's own elaboration

However, Baumol (1986) investigated the catch-up tendency of three groups of countries; i.e. industrialized, socialist and developing countries, and concluded that not all countries shared a tendency of convergence, but there were some poor countries which continued growing the most slowly (Verspagen, 1993).

Baumol, Blackman and Wolff (1989) investigated the role of education in the catch-up process and concluded that non-industrialized countries indicated no convergence without any education variables included in the model, but with the addition of an education variable, countries with similar levels of human capital tended to converge among themselves in levels of income. However, a tendency for countries with lower levels of human capital to catch-up with countries whose educational levels were higher was not observed (Baumol, 1994). Verspagen (1994) on the other hand, directed his attention to search for the influence of different technology indicators on the convergence or divergence patterns of the OECD countries over the post-war period. His findings indicated a period of convergence after the war until the 1980s, when the process seemed to have stopped. With regard to technology factors explaining this process, he found that R&D and knowledge spillovers were the most important sources of growth and the slowdown of growth after the 1980s could be explained by these factors.

2.2.2 Causes of Growth Rate Differentials

The logic behind these studies has been to show the capacity of endogenous growth models, when compared to the neo classical model in determining the factors explaining economic growth (Barro, 1991; Benhabib and Spiegel, 1994; Cappelen et al., 1999; Cheshire and Magrini, 2000; Gemmel, 1996; Rupasingha et al., 2001). Although attention has been given to various factors such as technology, research and development, political stability, institutions, etc. (Table 2.5), which may lead to differences in growth rates, most of the studies concentrated on the role of human capital as an indicator of the technological level (Verspagen, 1994). Despite the diversity of sources of economic growth and convergence, these models shared the common view that these variables

Table 2.5 A Summary of Empirical Studies of the Causes of Growth Rate Differentials

Author (s)	Sample	Variables	Results
Causes of Growth Rate Differentials			
Gemmel, 1996	98 developed and developing cuntries 1960-1985	-school enrollment rates of economically active pop -initial stocks of primary, secondary and tertiary human capital of economically active population -investment per GDP growth	-initial income and investment ratios have significant positive effects on growth -human capital has positive effects on growth both through 'initial stocks' and via 'subsequent accumulation' -human capital has significant positive direct effect on growth and indirect effect via affecting physical investment
Benhabib and Spiegel, 1994	78 developed and developing countries 1965-1985	-average levels of human capital as the indicator of direct effect of human capital -stock of human capital as the catching-up component -investment ratio -political instability	-human capital has a significant direct effect on growth by affecting domestically produced innovation and by facilitating the speed of adoption of technology from abroad -human capital has indirect effect on growth by attracting physical capital
Cappelen et al., 1999	European regions 1960-1995	-innovation -diffusion potential -complementary factors: education, infrastructure, population density, long-term employment, population growth rate-EU structural funds	-sigma convergence among EU countries -innovation and diffusion potential are positively related to regional growth -innovation and technology imitation are essential for the growth of advanced and less advanced regions respectively -structural funds do not have significant effect on growth

Source: Author's own elaboration

mattered for growth and were important in explaining causes of growth rate differentials. As opposed to the traditional one, this view underlies the importance of policy measures that take into account the critical role of the variables in the growth process (Baumol, 1994).

Barro (1991) and Gemmel (1996) used an aggregate level data in a group of 98 developed and developing countries in a period between 1960 and 1985. Barro's study focused on initial school enrollment rates to take into account flows of human capital and initial student-teacher ratios as an indicator of the quality of education. Results pointed to the positive correlation between growth and measures of initial human capital levels, and a negative relationship between growth and primary schooling student-teacher ratios. A negative relationship between growth and initial per capita income levels supported the neoclassical hypothesis that rich and poor countries converge towards the same level of per capita income, but only for a given quantity of human capital.

On the other hand, Gemmel's analysis distinguished between stocks and flows of human capital. Initial school enrollment rates and share of labor force embodying human capital are used respectively as indicators of human capital. The result was that both initial stocks and the accumulation of human capital had a positive role in promoting faster income growth. Besides this result, Gemmel's study emphasized the indirect effect of human capital on income growth via its positive effect on physical investment. Benhabib and Spiegel's (1994) model allowed for the direct effect of human capital on productivity by determining the capital of nations to innovate and its indirect effect by influencing the speed of technological diffusion or catch-up. Therefore, they used the stock of human capital and the average level of human capital over the period respectively, as proxies for human capital. Besides the inclusion of human capital as a factor, their model took into account other determinants of growth such as political instability, labor force, and income distribution. The results indicated a positive and significant effect of physical capital; and an insignificant effect of income distribution, political instability and labor force on growth. Moreover, the catch-up term is found to be positively and

significantly related with growth but the technological progress terms showed a negative sign. They concluded that human capital was important in "facilitating adoption of technology from abroad and creation of appropriate domestic technologies" (p. 160) and as an engine for attracting physical capital.

Besides these studies of determinants of growth across countries, some other studies attempted to explain the causes of growth among regions of Europe. For example, after summarizing some stylized facts on regional convergence in Europe, Cappelen et al. (1999) attempted to explain regional growth by using additional variables for innovation, diffusion potential and some complementary variables like education, infrastructure, industrial structure, long-term employment and population growth. Their findings indicated positive relationship between regional growth and innovation and diffusion potential. They concluded that R&D investment was more efficient for advanced regions, whereas for less advanced ones technology imitation appeared to be more effective for regional growth.

In a similar manner, Cheshire and Magrini (2000) paid particular attention to the role of R&D activities and some education factors such as universities as well as spatial and economic factors on regional growth in Western Europe. After testing for the process of convergence between 1978 and 1994 and they found that regional specialization between new knowledge creation and knowledge imitation was the major source of disparities among regions of Western Europe. Besides, education variables as indicators of technological competence were found to have significant and positive relationship with regional growth.

Rupasingha et al. (2001), on the other hand, searched for a wide set of factors in explaining differences in economic growth rates among US counties. They took account of social and institutional factors such as ethnic diversity, social capital, and accessibility to urban areas, etc. Their findings provided evidence to conclude that these factors are important for the economic growth of counties in the US. The study concluded by pointing to social and institutional dimensions in explaining regional differences in economic growth rates.

2.2.3 Criticisms to Concepts of Convergence

The neoclassical concepts of convergence are widely criticized as of their methodological weaknesses (Baumol, 1986; Benvenuti et al., 1999; Chatterji and Dewurst, 1996; Galor, 1996; Lopez-Bazo et al., 1999; Quah, 1993, 1996a, b).

One of the major criticisms is concerned with the complexity of the evolution of income. It refers to the fact that a pattern of convergence obtained from the use of these measures can hide a dualism or a polarization persistent in the distribution of income growth (Benvenuti et al., 1999). The complexity is characterized not only by the dualism between the rich and the poor economies but also by the differential growth of income within them, especially within the poor economies (Lopez-Bazo et al., 1999). Quah (1993, 1996a, b) demonstrated that in some situations, the distribution of income growth could indicate a pattern of convergence when, actually a polarization phenomenon persisted in the distribution. In this process, the better performers of the poor economies might appear to be catching up with the richer economies, in spite of the persisting differences between the lagging areas (Lopez-Bazo et al., 1999).

In the same line, Benvenuti et al. (1999) suggested that the use of neoclassical concepts of convergence could be misleading in economies with dualistic structures. They suggested that, in such cases, a long-run perspective, which would analyze the structural change, would be more important than a simple analysis of slow growth and faster growth areas.

One important issue related with this is defined as the fact that different groups of economies indicated different evolutions of income. Quah (1996b) argued that some richer countries remained rich and some poor countries remained poor, while some other countries took-off and shifted from rich to poor. The latter process, leads to a catch-up process but at the cost of leaving behind the poorest areas.

In somewhat parallel manner, another criticism regarded the fact that convergence took place in a certain types of regions. Baumol (1986), Chaterji

and Dewurst (1992) and Galor (1996) suggested *club convergence* as a third concept and argued that the distribution of income growth could indicate conditional convergence when only a club of economies exhibits convergence.

The last important criticism to the neoclassical concepts of convergence is related with spatial agglomeration. They have been criticized of not taking into account the forces of agglomeration in explaining the dynamics of income growth. The idea is that whether regions or countries exhibit a pattern of convergence or not depends on the level of spatial agglomeration they exhibit (Keilbach, 2000). It is suggested that spatially aggregated areas show a tendency towards income convergence, while in spatially disaggregated ones, the evolution of income indicates a more diversified pattern.

2.3 Criticisms to Endogenous Growth Theory

Although they proposed different components for growth, what the various models of endogenous growth theory have in common is that they view economic growth as a macroeconomic equilibrium process resulting with the convergence of regions or countries to a stationary growth path. Offering a more dynamic model than the Solowian growth theory by taking into account the possibility of multiple-equilibrium, new growth theories drew attention to the determinants of growth and sources of growth rate differentials. They acknowledged the importance of knowledge, human capital and research and development with particular emphasis on knowledge spillovers, externalities, and increasing returns.

However, like the neo classical approach to economic growth, the framework proposed by these models was based on macroeconomic equilibrium, which attempted to formulate the process of economic growth in mathematical terms (Nijkamp and Poot, 1998). Although technological change was emphasized as the main determinant of growth, their consideration of technical change was 'linear', which did not take into account the importance of feedback effects in the process of technological change. Moreover, regarding the sources of technological change these models put emphasis on radical changes but

neglected the importance of small improvements in this process. Correspondingly, they did not take into account the impact of time (history maters), space (space matters) and institutional factors (institutions matter) on technological change and growth (Amable, 1994).

Alternative explanation for economic growth and its implications for growth rate differentials are offered by evolutionary and institutional growth theories (Nelson, 1995). These models consider growth as an evolutionary process and attempts to explain the process of dynamic growth by considering the impact of time, institutions, and space and attempt to explain the dynamic process behind this change, which is cumulative and path-dependent. It makes use of the notions of diversity, selection, competition and creative destruction as forces that shape the economy. Technological change is emphasized as the main factor shaping economic growth and most studies attempted to explain how radical and incremental innovations as well as imitation influence growth rate differentials. Institutions, in the sense of formal rules and collectively shared behaviors, norms, routines and habits, are key elements that shape economic evolution. Social processes of learning are of fundamental importance to affect economic change.

The evolutionary view that economic growth is a process of continuous change through the interaction of economic as well as non-economic (social, technological and institutional) spheres has important implications regarding growth differentials over time and over countries, which makes the theory different from the neo classical and new growth models. It implies that a prediction of differences in growth rates is difficult. Economies need not converge to a steady state level in the long run, but a process of convergence as well as divergence of economic growth is possible to be observed (Verspagen, 2000). Such an understanding, obviously, looks for not the prediction of growth paths but an understanding of the factors behind the dynamic process of economic growth.

On the basis of these implications, empirical studies of evolutionary approach have attempted, on one hand, to link processes of innovation and diffusion to

trends of convergence/divergence. On the other hand, they have searched for the impact of non-economic factors (the impact of European integration, culture, firm organization) on economic growth. Therefore, evolution of regional disparities among regions and the causes of these differences lay at the center of the debate persisting in the evolutionary view, as they do in endogenous growth literature.

CHAPTER 3

EVOLUTION OF INCOME GROWTH DIFFERENTIALS AMONG REGIONS AND PROVINCES IN TURKEY

This chapter aims to contribute to the discussion on regional per capita income disparities by introducing empirical evidence about the tendency of sigma convergence or divergence among regions and provinces in Turkey over the period 1980-2000. For this aim, the first part provides the background for a detailed investigation of the evolution of regional income growth differences in Turkey. It examines the main features of income distribution in Turkey and gives the main contours of regional income growth differences in relation to Turkey's growth experience in period of analysis. The subsequent part takes a detailed account of the evolution of income growth differences among Turkish regions and provinces, by making use of measures of sigma convergence.

3.1 Main Features of Income Distribution in Turkey

Prior to a further investigation of per capita income figures for an understanding of the regional convergence/divergence tendencies between 1980-2000, it would be useful to examine briefly the changes in regional GDP levels in Turkey. Such an investigation would provide an initial picture of the distribution of income among Turkish regions and thus would help to see and understand its importance for a further analysis of regional inequalities.

A general distribution of per capita GDP figures among Turkish regions is shown in Table 3.1. These figures refer to values at fixed 1987 prices in Turkish liras and provide an understanding of comparative income levels of the seven geographical regions in Turkey between years 1980 and 2000.

It appears from the table that the Marmara region has always been the richest region of the country with its GDP per capita level higher than that of Turkey. The region of Aegean follows the Marmara region with a lower GDP level but its level is still greater than the nation's per capita GDP level. The Mediterranean region, whose GDP per capita level has been the closest to Turkey's, ranks the third in terms of income per capita, until 1999. It is worth mentioning that these regions host the main metropolitan regions of the country, Istanbul and Izmir, where the majority of the industrial activity is concentrated[1].

Beginning with 1999, per capita GDP of the Central Anatolia region exhibited higher levels than that of the Mediterranean region, which increased its rank among the seven geographical regions to the third in terms of per capita income levels. On the other hand, the level of per capita GDP of the Eastern and South Eastern Anatolia regions has been very small indeed, although the latter has recorded higher levels than the former. Per capita GDP level of the South Eastern Anatolia region has been approximately half the nation's, while that of the Eastern Anatolia has been even lower.

Table 3.2 shows the level of regional GDP per capita relative to the national average. Obviously, the examination of per capita GDP is important since it gives an idea about the relationship between population growth and GDP

[1] The difference between a metropolitan center and a metropolitan region is important. A metropolitan region consists of a metropolitan center and the settlements at its near periphery, which are extensions of the growth of the metropolitan center (Eraydin, 1994, 2002). These provinces became a part of these metropolitan regions mostly through the industrial decentralization process, taking place in these metropolitan centers since the 1970s as well as the reactivation of local capacities by local endeavor. The Istanbul metropolitan region is composed of the Kocaeli, Sakarya, Tekirdağ and Bursa provinces, although, different from the others, the Bursa province has its own industrial and growth basis. The Izmir metropolitan area, on the other hand, consists of the provinces of Manisa, Aydın and Denizli, that are positioned at its near periphery.

Table 3.1 Regional Distribution of GDP per capita in Turkey, 1980-2000 (at 1987 fixed prices, TL)

Regions/years	Mediterranean	Eastern Anatolia	Aegean	South Eastern Anatolia	Central Anatolia	Black Sea	Marmara	Turkey
1980	1.234.507	535.889	1.415.290	603.366	1.039.175	903.592	1.823.845	1.143.529
1981	1.262.511	555.626	1.396.983	657.687	1.042.840	916.896	1.884.405	1.169.945
1982	1.329.364	583.752	1.529.523	628.763	1.103.511	903.215	1.986.993	1.176.822
1983	1.259.137	553.150	1.474.198	604.530	1.043.072	904.410	1.979.831	1.196.037
1984	1.307.335	551.049	1.557.093	614.848	1.101.124	943.009	2.075.524	1.250.022
1985	1.223.223	582.420	1.606.168	648.619	1.111.454	934.448	2.137.829	1.271.326
1986	1.279.144	604.114	1.682.390	658.874	1.140.277	984.464	2.247.134	1.327.719
1987	1.392.593	579.038	1.763.388	855.824	1.335.397	929.497	2.232.730	1.421.616
1988	1.373.300	587.484	1.781.873	898.696	1.336.385	934.206	2.182.669	1.420.590
1989	1.402.577	570.861	1.723.834	815.547	1.228.666	959.270	2.169.730	1.393.577
1990	1.481.551	615.865	1.822.911	890.773	1.364.712	1.001.788	2.274.373	1.487.082
1991	1.401.432	601.715	1.771.806	914.658	1.389.555	1.004.797	2.237.249	1.472.000
1992	1.453.896	626.713	1.856.538	918.768	1.424.737	1.077.467	2.309.062	1.530.808
1993	1.554.760	648.386	1.987.366	953.969	1.505.712	1.097.752	2.455.326	1.623.613
1994	1.452.261	643.754	1.918.373	853.544	1.427.576	1.063.647	2.169.458	1.507.540
1995	1.518.992	630.947	2.006.804	860.889	1.491.057	1.110.456	2.325.991	1.587.954
1996	1.554.081	647.481	2.103.466	888.899	1.549.648	1.213.393	2.457.502	1.670.657
1997	1.706.976	660.216	2.246.740	986.350	1.639.513	1.294.737	2.684.291	1.802.763
1998	1.712.882	673.339	2.280.039	989.641	1.708.810	1.366.704	2.667.003	1.829.755
1999	1.617.706	656.732	2.117.534	902.960	1.623.860	1.326.361	2.472.951	1.719.559
2000	1.607.672	635.411	2.234.412	925.812	1.650.019	1.279.616	2.621.463	1.760.856

Source: Calculated based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

growth. This is especially crucial in a country where migratory movements continue and are of significant importance in shaping the spatial structure (Eraydın, 1992). However, a mere examination of regional per capita income levels may not be sufficient. This is because any conclusion regarding regional growth performances may be misleading. A decline in regional per capita GDP level relative to the national average does not necessarily mean a decline in regional GDP share in the national income. In such cases, it may be misleading to conclude that these regions did not perform well relative to the nation. The decline in their per capita GDP levels may be because of significant increases in their populations although their shares in the national GDP increased reasonably or stayed stagnant. Therefore, it is reasonable at this point to examine the regional distribution of national GDP as well so as to see the share of each region in national GDP (Table 3. 3).

Table 3.2 illustrates that the Marmara, Aegean and Mediterranean regions, respectively, had the highest level of per capita income relative to the national average in the period 1980-1998. However, per capita income level of the Marmara and Mediterranean regions have tended to decline from 1980 to 2000 relative to the national average, while that of the Aegean region tended to rise significantly. But when Table 3.3 is examined it is seen that the share of these regions in Turkey's GDP have tended to increase in the same period. Obviously, the declining trend in the per capita GDP levels of these regions relative to the national average can, to a certain extent, be attributed to the intensive population increase in these regions due to migration from other regions of the country for the employment opportunities provided in these regions.

On the other hand, the Agean region, which had the second highest GDP per capita relative to the nation, had almost the same share in the national GDP with the Central Anatolia region. But the Central Anatolia region has had a relatively higher population increase because of which its per capita GDP share relative to the national average has been much lower than that of the Agean region.

Table 3.2 Regional GDP per capita Relative to the National Average, 1980-2000 (at 1987 fixed prices, %)

Regions/years	Mediterranean	Eastern Anatolia	Aegean	South Eastern Anatolia	Central Anatolia	Black Sea	Marmara	Turkey
1980	107,96	46,86	123,77	52,76	90,87	79,02	159,49	100
1981	107,91	47,49	119,41	56,22	89,14	78,37	161,07	100
1982	112,96	49,60	129,97	53,43	93,77	76,75	168,84	100
1983	105,28	46,25	123,26	50,54	87,21	75,62	165,53	100
1984	104,58	44,08	124,57	49,19	88,09	75,44	166,04	100
1985	96,22	45,81	126,34	51,02	87,42	73,50	168,16	100
1986	96,34	45,50	126,71	49,62	85,88	74,15	169,25	100
1987	97,96	40,73	124,04	60,20	93,94	65,38	157,06	100
1988	96,67	41,35	125,43	63,26	94,07	65,76	153,65	100
1989	100,65	40,96	123,70	58,52	88,17	68,84	155,69	100
1990	99,63	41,41	122,58	59,90	91,77	67,37	152,94	100
1991	95,21	40,88	120,37	62,14	94,40	68,26	151,99	100
1992	94,98	40,94	121,28	60,02	93,07	70,39	150,84	100
1993	95,76	39,93	122,40	58,76	92,74	67,61	151,23	100
1994	96,33	42,70	127,25	56,62	94,70	70,56	143,91	100
1995	95,66	39,73	126,38	54,21	93,90	69,93	146,48	100
1996	93,02	38,76	125,91	53,21	92,76	72,63	147,10	100
1997	94,69	36,62	124,63	54,71	90,94	71,82	148,90	100
1998	93,61	36,80	124,61	54,09	93,39	74,69	145,76	100
1999	94,08	38,19	123,14	52,51	94,43	77,13	143,81	100
2000	91,30	36,09	126,89	52,58	93,71	72,67	148,87	100

Source: Calculated based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

Table 3.3 Regional Distribution of GDP in Turkey, 1980-2000 (at 1987 fixed prices, %)

Regions/years	Mediterranean	Eastern Anatolia	Aegean	South Eastern Anatolia	Central Anatolia	Black Sea	Marmara	Turkey
1980	11.79	5.00	16.46	4.21	16.78	12.14	33.62	100
1981	11.85	5.02	15.91	4.54	16.44	11.98	34.26	100
1982	11.37	8.77	15.92	4.02	15.84	10.86	33.23	100
1983	11.62	4.83	16.41	4.18	15.97	11.32	35.68	100
1984	11.48	4.57	16.58	4.12	16.09	11.12	36.04	100
1985	10.79	4.72	16.82	4.32	15.91	10.66	36.78	100
1986	10.78	4.63	16.80	4.24	15.87	10.55	37.13	100
1987	11.96	4.09	16.58	5.23	16.91	9.97	35.26	100
1988	11.87	4.09	16.80	5.56	16.83	9.85	35.00	100
1989	12.43	3.99	16.60	5.21	15.66	10.12	35.98	100
1990	12.37	3.97	16.48	5.40	16.19	9.73	35.86	100
1991	11.89	3.83	16.21	5.72	16.54	9.67	36.13	100
1992	11.93	3.77	16.37	5.59	16.20	9.78	36.35	100
1993	12.10	3.62	16.55	5.54	16.03	9.21	36.94	100
1994	12.24	3.81	17.24	5.40	16.26	9.42	35.63	100
1995	12.22	3.49	17.15	5.23	16.02	9.15	36.74	100
1996	11.95	3.34	17.12	5.20	15.67	9.33	37.38	100
1997	12.12	3.28	16.75	5.32	15.35	9.04	38.14	100
1998	12.03	3.27	16.75	5.31	15.66	9.20	37.78	100
1999	12.13	3.37	16.55	5.20	15.73	9.30	37.72	100
2000	11.73	3.27	16.76	5.11	16.07	9.08	37.98	100

Source: Calculated based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

In contrast, the Eastern Anatolia, South Eastern Anatolia and Black Sea regions, respectively, appear to have had the smallest GDP per capita relative to national GDP per capita. The same holds true when we look at their shares in the national GDP. Yet, it is seen that the share of the Eastern Anatolian region had a tendency to decline from 5,32 percent in 1980 to 3,27 percent in 2000, and that of the Black Sea region from 12,72 percent in 1980 to 9,08 percent in 2000. On the contrary, the share of the Southeastern Anatolia region tended to increase from 4,07 to 5,11. An interesting situation is observed for the Eastern Anatolia and Southeastern Anatolia regions. Prior to 1987, the former had a bigger share in the national GDP than the latter. The increasing share of the Southeastern Anatolia region since 1987 is because of the GAP project initiated in this year, which aimed to stimulate the agriculture potential of the region and transform it into an export center based on agriculture (Eraydın, 1992). The positive effects of the project are reflected by the increase in its GDP share.

Table 3.4 contains the annual growth rates of GDP per capita in the period 1980-2000 and gives a better picture of regional income performances. It appears both from the table and Figure 3.1 that nationally per capita income growth indicates erratic trends in the last two decades. In the first decade, between 1980 and 1990, annual growth rate of per capita GDP varied between a decline rate of 4,21 percent and a growth rate of 7,07 percent per year. The decline of per capita GDP in 1980 can be explained by the worldwide crisis, which put into force the transformation of the world economic, political and social conjuncture. The significant rise in the oil prices in the late 1970s, together with the existing problems of the Turkish economy, was reflected by a negative 4,21 percent growth rate in Turkey's GDP per capita.

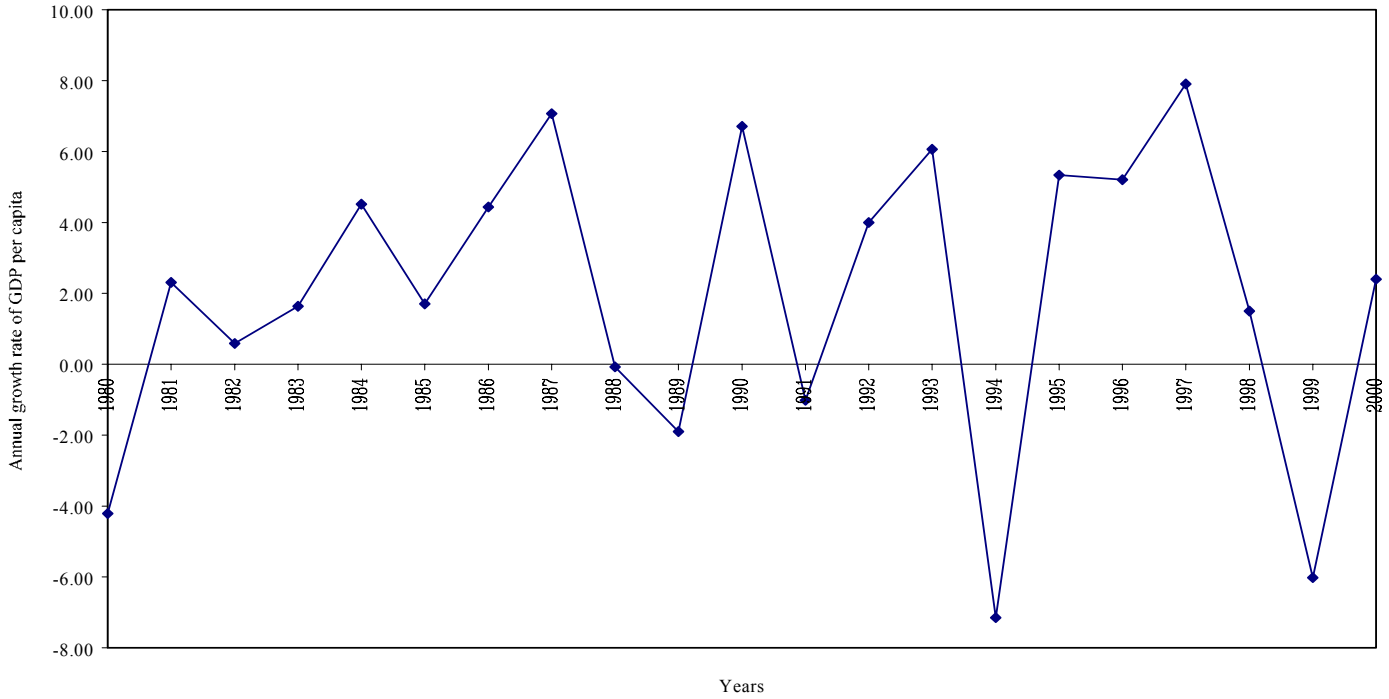
Obviously, the protectionist economic and industrial policies, which dominated the Turkish economy in the 1960s and 1970s, were not sufficient to adapt to the radical changes taking place in the world conjuncture and overcome their negative effects. This negative situation forced the Turkish government to introduce a long-term stabilization and structural adjustment program. The new program changed

Table 3.4 Annual Growth Rate of GDP per capita in Turkey, 1980-2000 (%)

Regions/years	Mediterranean	Eastern Anatolia	Aegean	South Eastern Anatolia	Central Anatolia	Black Sea	Marmara	Turkey
1980	2,64	-9,42	1,41	-2,10	-4,23	-7,62	-7,64	-4,21
1981	2,27	3,68	-1,29	9,00	0,35	1,47	3,32	2,31
1982	5,30	5,06	9,49	-4,40	5,82	-1,49	5,44	0,59
1983	-5,28	-5,24	-3,62	-3,85	-5,48	0,13	-0,36	1,63
1984	3,83	-0,38	5,62	1,71	5,57	4,27	4,83	4,51
1985	-6,43	5,69	3,15	5,49	0,94	-0,91	3,00	1,70
1986	4,57	3,72	4,75	1,58	2,59	5,35	5,11	4,44
1987	8,87	-4,15	4,81	29,89	17,11	-5,58	-0,64	7,07
1988	-1,39	1,46	1,05	5,01	0,07	0,51	-2,24	-0,07
1989	2,13	-2,83	-3,26	-9,25	-8,06	2,68	-0,59	-1,90
1990	5,63	7,88	5,75	9,22	11,07	4,43	4,82	6,71
1991	-5,41	-2,30	-2,80	2,68	1,82	0,30	-1,63	-1,01
1992	3,74	4,15	4,78	0,45	2,53	7,23	3,21	4,00
1993	6,94	3,46	7,05	3,83	5,68	1,88	6,33	6,06
1994	-6,59	-0,71	-3,47	-10,53	-5,19	-3,11	-11,64	-7,15
1995	4,59	-1,99	4,61	0,86	4,45	4,40	7,22	5,33
1996	2,31	2,62	4,82	3,25	3,93	9,27	5,65	5,21
1997	9,84	1,97	6,81	10,96	5,80	6,70	9,23	7,91
1998	0,35	1,99	1,48	0,33	4,23	5,56	-0,64	1,50
1999	-5,56	-2,47	-7,13	-8,76	-4,97	-2,95	-7,28	-6,02
2000	-0,62	-3,25	5,52	2,53	1,61	-3,52	6,01	2,40

Source: Calculated based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

Figure 3.1 Annual Growth Rate of GDP per capita in Turkey, 1980-2000



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

the national industrial and growth policies and became the turning point in the Turkish economy. Firstly, it was founded on the idea that protectionist economic policies were discarded in favor of the ones that rely on market forces. Secondly, included in the scope of this course of action, was the transformation of the national industrial policy from import substitution to export oriented one and to attract foreign investments. With this change in the national industrial policy, the program sought export-oriented growth in return for economic growth based on import substitution, which dominated the pre1980 period (Eraydın, 2002).

Based on these foundations, foreign exchange controls, quotas on imports and tariffs were abolished to liberalize trade (Şenses, 1994). In addition to these, policies were directed to cut down public expenditures and increase exports by the effective use of existing capacities. Correspondingly, policies and measures were directed to decrease the price of export goods instead of decreasing production costs (Kepenek and Yentürk, 1996). Exchange rates were depreciated, national demand together with workers' wages was declined, and direct subsidies to export sectors were increased (Boratav and Türkcan, 1994; Eraydın, 2002; Kepenek and Yentürk, 1996).

It is possible to see from the table the positive effects of the economic program put into action in 1980. This is reflected by the growth of national income per capita in the period 1981-1987, although with fluctuations. The table indicates relatively small rate of growth in the first years after the initiation of the program (for example 0,59 % and 1,63 percent in 1982 and 1983). This was because the aim of the program was not economic growth but to restrict investments and increase exports by effective use of existing capacities.

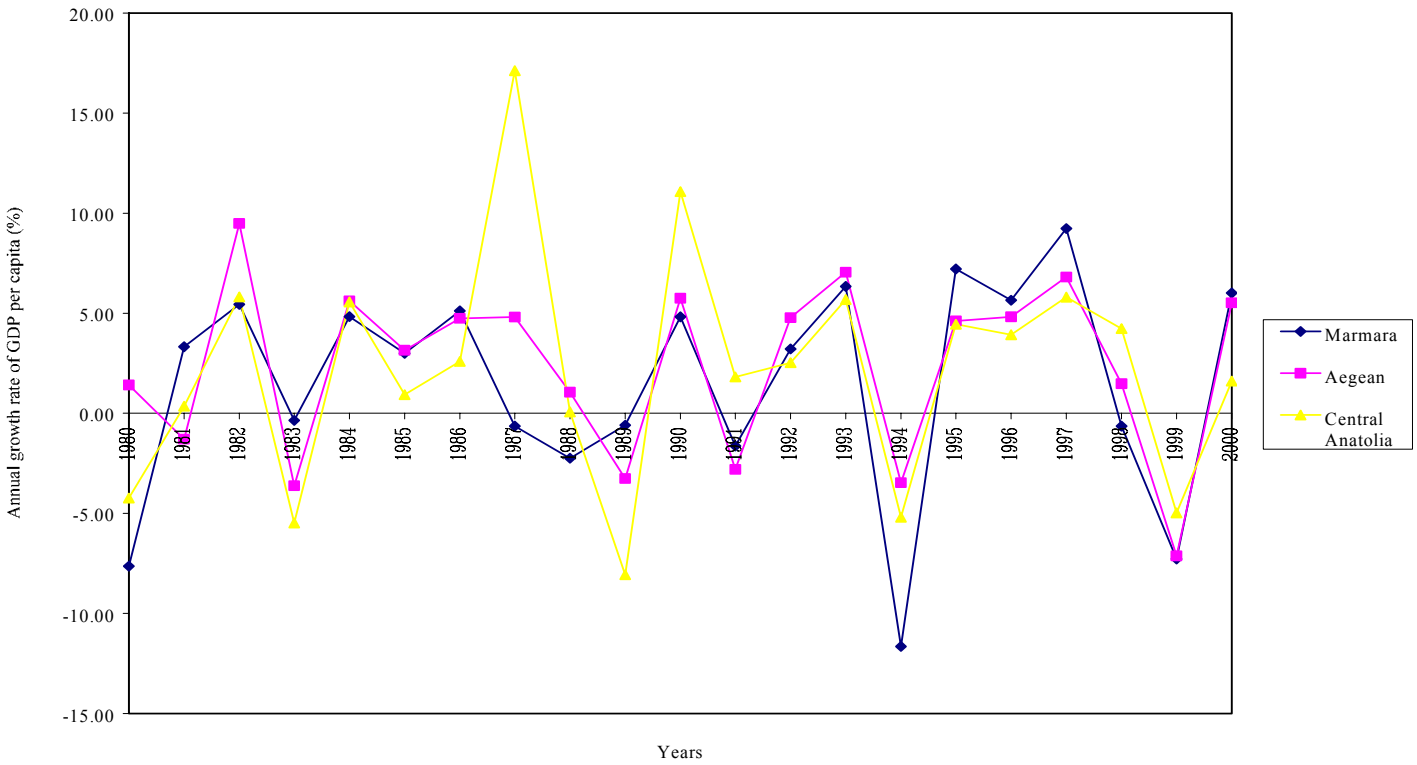
In the following years, corresponding to the export-oriented growth, export schemes and measures to support exports were intensified further and incentives were directed to manufacturing as the export sector. Apparently, given little investments in manufacturing activity and the policy to increase exports by the

effective use of existing capacities favored mostly the industrial centers developed in the pre-1980 period under the import substitution policy. The Marmara and Aegean regions, which contain the biggest metropolitan regions of Turkey, Istanbul and Izmir metropolitan areas, indicated the fastest income growth because of their already existing industrial capacities and their increasing importance as trade nodes, given the growth of trade relations in this period (Eraydın, 1994). As it can be followed from Figure 3.2, the per capita GDP of these regions indicated faster growth than that of Turkey between 1980 and 1987 (for example 5,44 and 9,49 percent when compared to 0,59 percent in 1982 and 5,11 and 4,75 percent when compared to 4,44 percent in 1986).

In addition to these metropolitan regions with relatively developed manufacturing capacities, some less developed areas exhibited significant growth performances with increasing shares of manufacturing industry in the late 1980s (such as Çorum, Denizli, Gaziantep, K.Maraş, Kayseri and Konya). These regions were referred to as examples of industrial districts in developing countries and their unexpected growth was explained by their ability to utilize the local capacities and getting the benefit of their experience as well as socio-economic conditions (Eraydın, 1992, 2002).

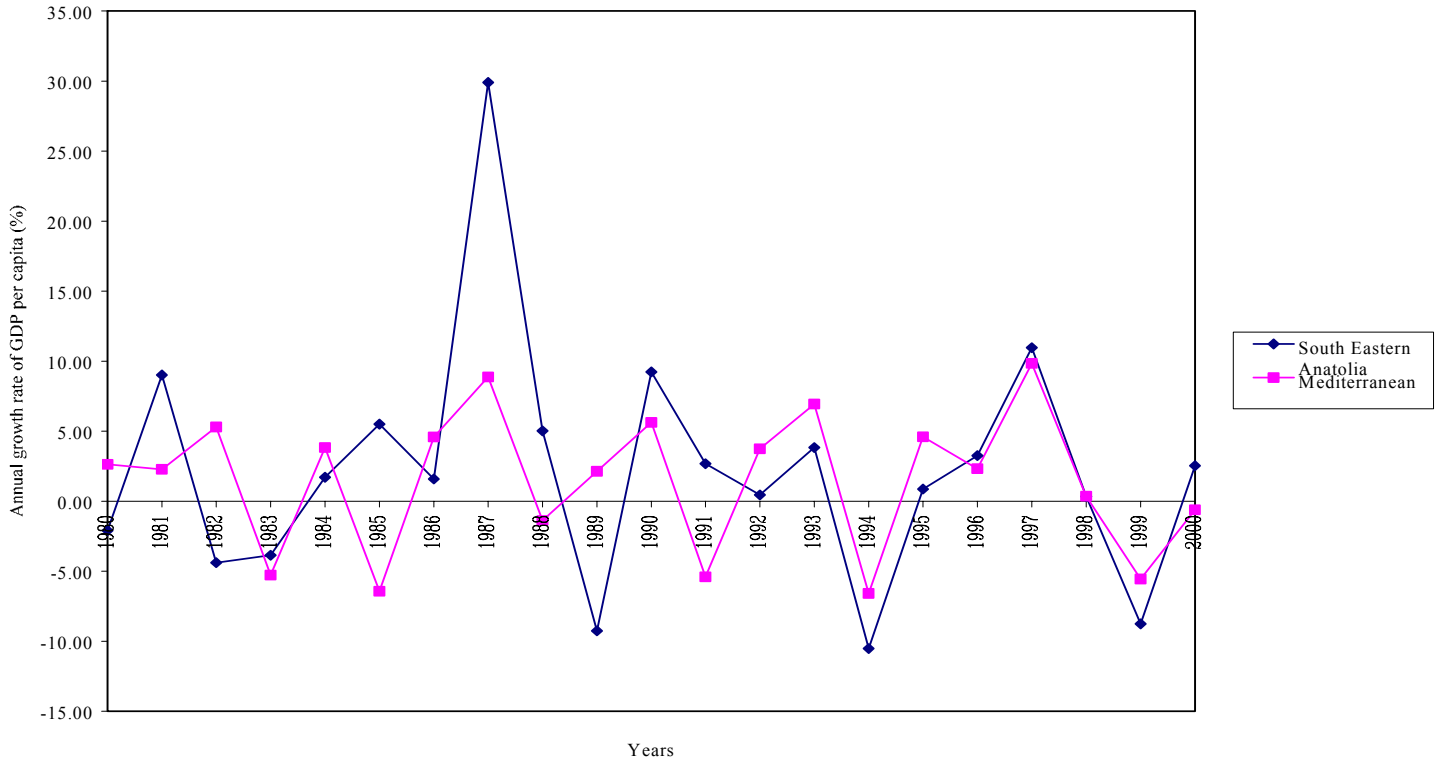
Under the new economic program, some other incentives were directed to tourism activities in the Aegean and Southern coastal areas. Parallel with the withdrawal of the state from manufacturing investment, public investments were directed to transportation, communication and energy sectors. Subsequently, private investment towards tourism and housing activities increased considerably (Şenses, 1994). Tourism activities were directed to foreign tourism and big tourism projects were encouraged to attract foreign investors. As a result of these, per capita income grew at 8,87 percent in the Mediterranean region, while the rate was 2,64 percent in 1980 (Figure 3.3). As a result of these developments, in the period 1984-1987, per capita income of Turkey exhibited significant growth with a pace of 4,5 percent in 1984 and 7 percent in 1987.

Figure 3.2 Annual Growth Rate of GDP per capita in Marmara, Aegean and Central Anatolia Regions, 1980-2000



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

Figure 3.3 Annual Growth Rate of GDP per capita in Southeastern Anatolia and Mediterranean Regions, 1980-2000



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

On the other hand, despite the policy of the program to limit public investment, some incentive schemes were defined for special assistance to less developed areas with very limited natural resources and local capacities. For this aim, priority areas for financial assistance were defined for most of the provinces in the Eastern Anatolia and Black Sea regions[2]. Despite these schemes, per capita GDP of these regions grew slower than that of the national average, with negative rates most of the time (for example, -5,24 and –0,36 in 1983 and –4,15 and –5,58 in 1987 where the national average was 1,63 and 7,07 respectively). It appears that these regions could not respond to the incentive schemes and could not adapt to the rapidly changing conditions of this period.

The year 1987 appears to be the turning point for the Southeastern Anatolia region. While the other two regions continued to be the losers in terms of per capita income growth, the Southeastern Anatolia region seems to perform better since 1987. Of course this was because of the incentives and investments directed to stimulate the agricultural potential of the Southeastern Anatolia region and transform it into an export center based on agriculture, an aim defined in the scope of the GAP regional development plan (Eraydın, 2002). Obviously, the aim of the export oriented development program was to integrate the Turkish economy to the changing conditions of the global economy. New policies and measures were defined to achieve this aim and positive effects of these on the economy were reflected by increases in national and regional growth rates of GDP per capita.

However, policies to increase exports were restricted to financial measures, which had only short-term effects (Kepenek and Yentürk, 1996). These short-term policies, obviously, restricted new investments directed to capacity increase in production and delayed the adaptation of new technologies in the production process (Boratav and Türkcan, 1994). Yet, international economic

[2] Definition of priority areas for development goes back to 1968. In 1968, 22 provinces were included in the scope of priority areas for development, the number of which reached to 41 in 1979 and 40 in 1980. Beginning with 1981, first and second priority areas were differentiated. In 1981, 20 provinces were defined as first priority areas and 5 provinces as second priority areas, while in 2002 these numbers were increased to 23 and 12, respectively (DPT, 2003).

agreements signed after 1987 for a further liberalization of international trade made it difficult to make use of these financial measures (Eraydın, 2002). First, the GATT agreement signed in 1989 abolished export incentives and subsidies, which served to reduce investment costs and the need for external financing, and increase profitability of export activities since 1980 (Togan, 2001)[3]. Following this, in 1989, Turkish lira was converted in order to facilitate the transfer of foreign capital to further increase foreign investments.

With these developments, the economy became more integrated to the global economy and the industry was forced to behave in an intensively competitive environment. Obviously, policies based on financial measures were not sufficient to ensure competitiveness in the face of intensive competition. Adaptation of the mechanisms, institutions and organizations to the rapidly changing conditions of the global economic system was lacking and this was reflected by a decline in the national per capita income, the rate of which was 0,07 percent in 1988 and 1,9 percent in 1989.

This negative trend was intensified in the 1990s. It became a necessity to change the existing measures and policies, which were not in effect any more. Several fiscal rearrangements were defined to change the negative trends in the growth of the Turkish economy. Different from the policies of the 1980-1987 period, which ceased economic growth in return for stabilization and liberalization, policies in the 1990-1993 period defined stationary economic growth as an objective. Despite this objective of steady economic growth, annual GDP per capita growth rates indicated fluctuations in this period. Obviously, this was because of short-term fiscal policies in this period in preference to new and longer-term economic policies for a sustainable competitive advantage of the Turkish economy in the international markets (Kepenek and Yentürk, 1996). These unreasonable economic policies led to a

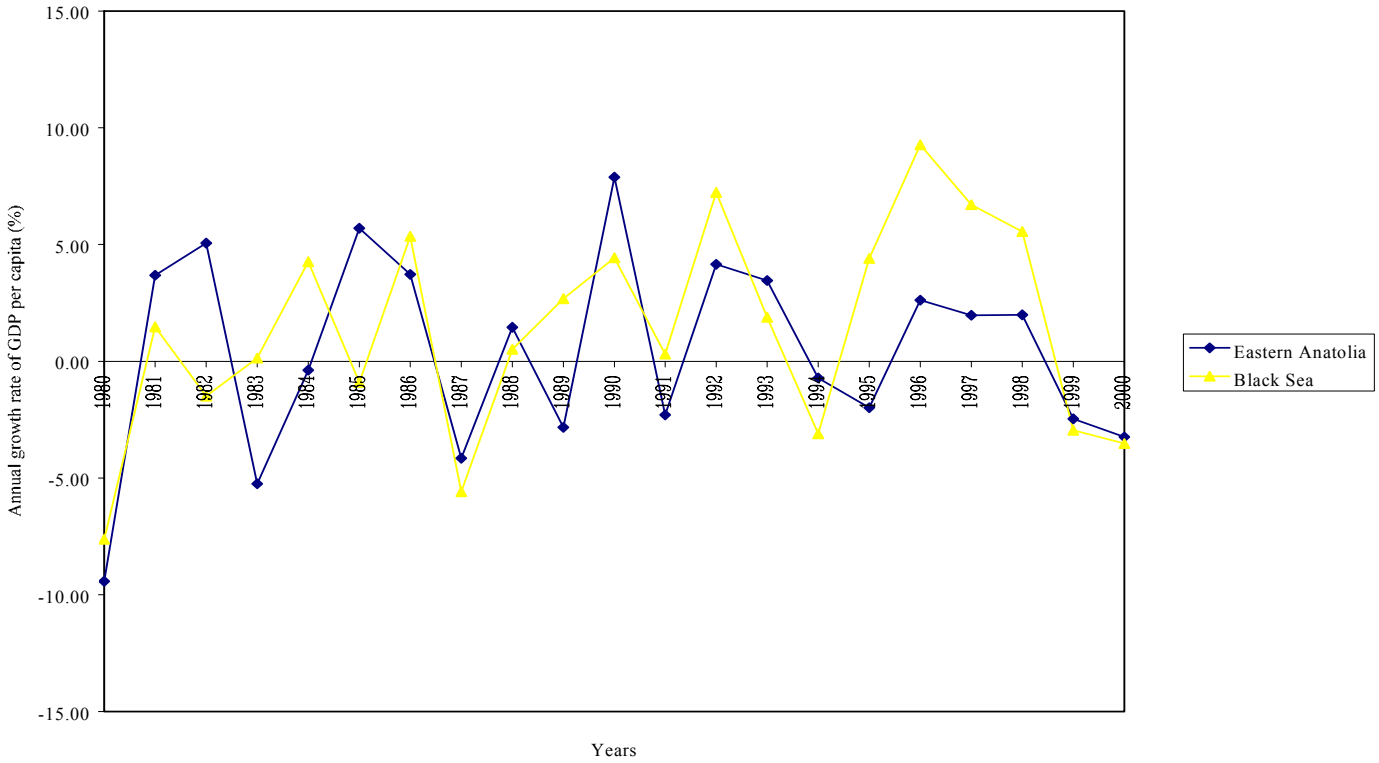
[3] The GATT Agreement aimed to restrict tariffs and subsidies, used as measures of intervention to the national economy, in order to eliminate their negative effects on world trade and to provide other measures of intervention (Doğuş, 2000). The agreement restricted subsidies to R&D activities and environmental projects and incentives to export activities were directed to participation in and organization of trade fairs and educational activities such as seminars and conferences (Togan, 2001).

big economic crisis in 1994, when GDP per capita declined at an alarming pace of annual 7,15 percent. Declines in the regional annual growth rate of per capita GDP in 1994 reflect the collapse of the economy. Given the general negative climate all regions exhibited significant declines in their per capita income growth rates. The severest losses were recorded in the Marmara and South Eastern Anatolia regions (-11,64% and –10,53% respectively). It appears from Figure 3.4 that the two peripheral regions of the country (Eastern Anatolia and Black Sea regions) seem to be the least affected ones since their income declined at slower rates than that of the nation (0,71% and 3,11% respectively, when compared to the national 7,15%). Recognizing the insufficiency of financial measures, Turkey adopted another economic stabilization program, where policies for competition were defined so as to recover the economy from the crisis conditions. The aim of this new program was to decline the rate of inflation and control interest rates. As a part of this, the program sought to create a new economic environment by increasing national demand and private sector investments (Eraydın, 2002).

As depicted by the table, the following years appear to be the recovery periods reflected by a 5 percent annual growth rate in 1995 and 1996. However, this growth might not indicate the very successful performance of the national economy. It would be better to evaluate this growth together with the severest loss of Turkey in the previous year in terms of its income per capita (Şahin, 2000). In fact, regional shares of GDP exhibited declines following the crisis, except for the Marmara region (35,63 percent in 1994 and 38,14 in 1997).

Figure 3.4 demonstrates that the situation is even worse for the Eastern Anatolia and Black Sea regions, which had the severest declines in their GDP shares (from 3,81 in 1994 to 3,28 in 1997 and from 9,42 in 1994 to 9,04 in 1997, respectively). Yet, in 1998 both national and regional growth rates of per capita GDP declined. As a result of this negative trend, reflected by declines in regional GDP shares and per capita GDP growth rates, regional disparities came into the agenda with increasing emphasis and regional plans were prepared for the loser regions. Regional development plans for East Anatolia

Figure 3.4 Annual Growth Rate of GDP per capita in Eastern Anatolia and Black Sea Regions, 1980-2000



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

and Eastern Black Sea regions prepared after 1998 focused on the sustainable development of regions based on their local socio-economic resources and existing opportunities. Given their very limited local resources, these plans defined programs to direct public investments for the realization of infrastructure and production activities in these regions (Eraydın, 1992).

However, such an emphasis on public resources was not realistic in a world where the economic power of states was declining. The situation got worse with the economic crises in the Southeastern Asia and Russia, which Turkey had close trade relations. The crisis conditions from the external world were further reinforced by a significant financial decline in the Turkish economy, which had serious effects on the economies of metropolitan areas of the country.

The negative signs of this crisis were reflected by a severe decline in the national income per capita, at a rate of 6 percent in 1999. It seems from the figures in the table that the effect of the 1999 economic crises on the national income per capita was as bad as the 1994 economic crisis, when per capita income growth declined by 7,15 percent. The Marmara, Aegean and South Eastern Anatolia regions appear to be the worst affected regions with growth rates slower than that of the nation (-7,28%, -7,13% and -8,76% when compared to -6,02%). It should be recalled that the Marmara and Aegean regions contain the regions, which developed as the export centers of Turkey based on manufacturing activity and the Southeastern Anatolia region on the other hand developed with its agricultural potential directed to export activity. Obviously, a crisis in the external world hit those regions whose growth dynamics were based on the trade relations with those countries.

The general analysis of per capita income figures and their respective growth rates summarized thus far points to a fluctuating trend in terms of per capita income growth in Turkey. It can be argued that sharp negative trends in the Turkish economy follow very short-term positive trends, especially since the late 1980s. This situation is usually the outcome of short-term fiscal decisions,

the aim of which was to eradicate the negative consequences of the crisis in the very short time. Even the economic stabilization programs, which sought the transformation of the economy, did not record any permanent or long-term growth in terms of per capita income. This is obviously because no such structural and organizational transformation, that would adapt the economy to the rapidly changing conditions of the world and sustain competitive advantage in the global markets, could be achieved. As a result, the offered economic programs had only temporary positive effects on the income growth of Turkey.

The above examination gave a general picture of the process of differential income growth among the regions in Turkey. At one extreme are the Marmara and Aegean regions, which host the major industrial and export activities. These regions do better in terms of per capita income that they appear to be the most dynamic regions in terms of income growth. Related with this fact, in crisis periods, when per capita income of Turkey declines, these regions exhibit the highest declines in their per capita income growth rates.

At the other extreme are the Eastern Anatolia, South Eastern Anatolia and Black Sea regions, whose per capita GDP shares are the lowest in the period 1980-2000. In terms of the annual growth rate of income per capita, the Eastern Anatolia and Black Sea regions are less affected in crisis periods while the Southeastern Anatolia region appears to be one of the worst affected regions. However, it is usually when per capita income of the nation and most of the regions grow significantly that the Eastern Anatolia and Black Sea regions exhibit relatively worse performances.

The general distribution of per capita income and the respective annual growth rates in the seven geographical regions of Turkey, analyzed above, gave a rough picture of the erradic trend growth of income per capita and its unequal distribution in Turkey. It would be essential at this point to examine the evolution of regional per capita income disparities in Turkey. This is important for it would give a picture of income convergence trend among the regions and provinces in Turkey.

3.2 Sigma Convergence of Income: Evolution of Income Disparities among Regions and Provinces in Turkey

In the literature on endogenous growth, the study of sigma convergence aims to examine the evolution of the distribution of income over time (Barro and Sala-i Martin, 1992, 1995; Cappelen et al., 1999; Cuadrado-Roura, 2001; Sala-I Martin, 1990, 1996a, b; Soete, 2002; Verspagen, 1994). Sigma convergence relates to the reduction of per capita income differences across economies. In other words, sigma convergence exists if the dispersion or variation of per capita income across regions tends to fall over time. Sigma convergence of income is measured by examining trends in various indexes. Most usually used indicators of income differences in the analysis of sigma convergence are the standard deviation and the coefficient of variation of income[4].

Given the great variation of GDP per capita over time in Turkey, the process of sigma convergence of income across Turkish provinces will be investigated by using the logarithm of per capita GDP as the proxy of income. Taking the log of per capita GDP would make the income values more normally distributed over time. The annual per capita GDP data used in the analysis is at fixed 1987 prices in Turkish liras. Data at the regional and provincial level is computed by Özütün, E. (1988) for the period 1979-1986 and by the State Planning Organization for the period 1987-2000[5]. To assess whether there has been sigma convergence among regions in Turkey, both the standard deviation and the coefficient of variation of the log of per capita GDP is calculated for the period 1980-2000.

Table 3.5 displays summary statistics for log GDP per capita. It appears from the table and Figure 3.5 and Figure 3.6 that the standard deviation and coefficient of variation of log GDP per capita fluctuate over time. The rise in the coefficient of variation and the standard deviation suggests that over these

[4] The coefficient of variation is defined as the standard deviation divided by the mean. By definition, this measure reflects the combination of the influences of both the mean and the standard deviation.

[5] GDP per capita figures computed by Özütün (1988) for the period 1979-1986 was at fixed 1979 prices. These figures are transformed to fixed 1987 prices by using GDP deflator computed by SIS.

periods, regions tended to diverge in terms of their log GDP per capita. On the contrary, the times when the standard deviation and coefficient of variation tend to decline point to convergence of log GDP per capita among regions in Turkey. Beginning from here, interpretations for regional dispersion of per capita income in Turkey will refer to coefficient of variation of log GDP per capita.

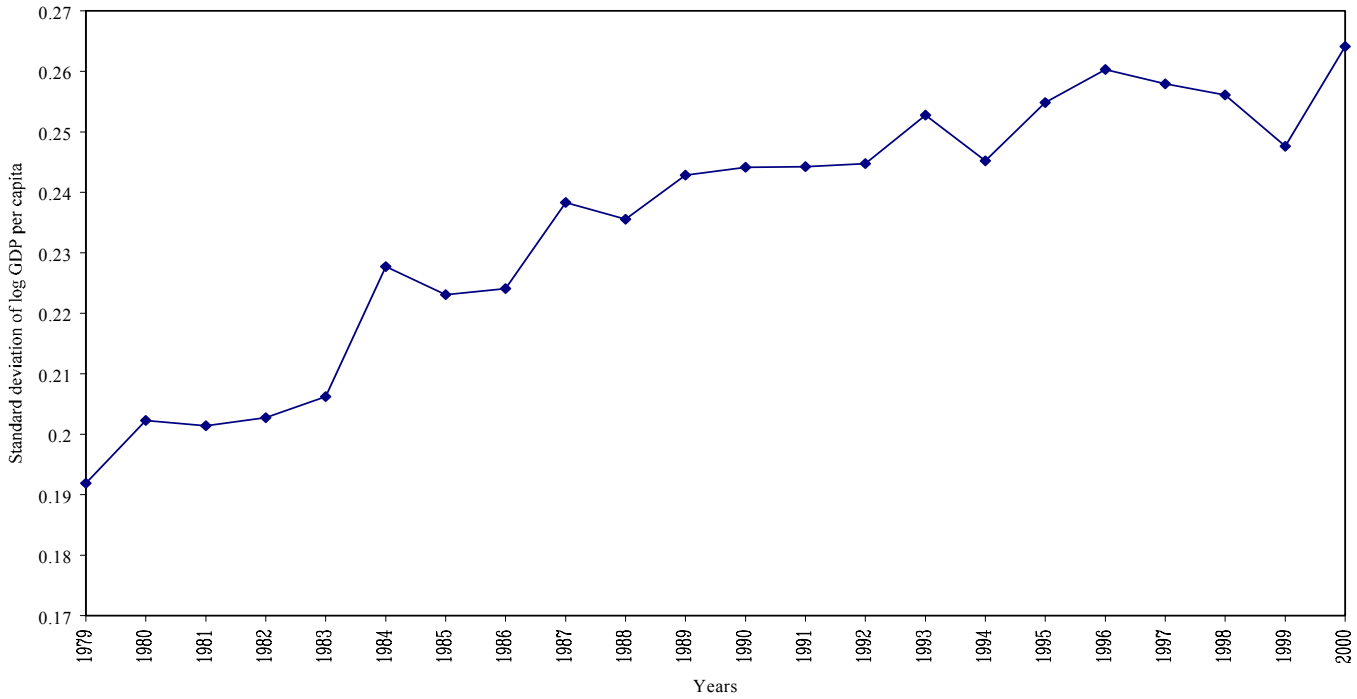
Table 3.5 Summary Statistics for log GDP per capita, 1980-2000 (by geographical regions)

Regions/years	mean	standard deviation	coefficient of variation
1980	5,99795	0,19277	0,03214
1981	6,00928	0,18550	0,03087
1982	6,02424	0,19715	0,03273
1983	6,00917	0,20082	0,03342
1984	6,02459	0,20851	0,03461
1985	6,03099	0,20232	0,03355
1986	6,04780	0,20582	0,03403
1987	6,07542	0,20038	0,03298
1988	6,07809	0,19425	0,03196
1989	6,06560	0,19833	0,03270
1990	6,09477	0,19438	0,03189
1991	6,09004	0,19119	0,03139
1992	6,10587	0,19125	0,03132
1993	6,12709	0,19743	0,03222
1994	6,10038	0,18923	0,03102
1995	6,11494	0,20116	0,03290
1996	6,13417	0,20368	0,03320
1997	6,16475	0,20923	0,03394
1998	6,17282	0,20706	0,03354
1999	6,14774	0,20261	0,03296
2000	6,15258	0,21421	0,03482

Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000.

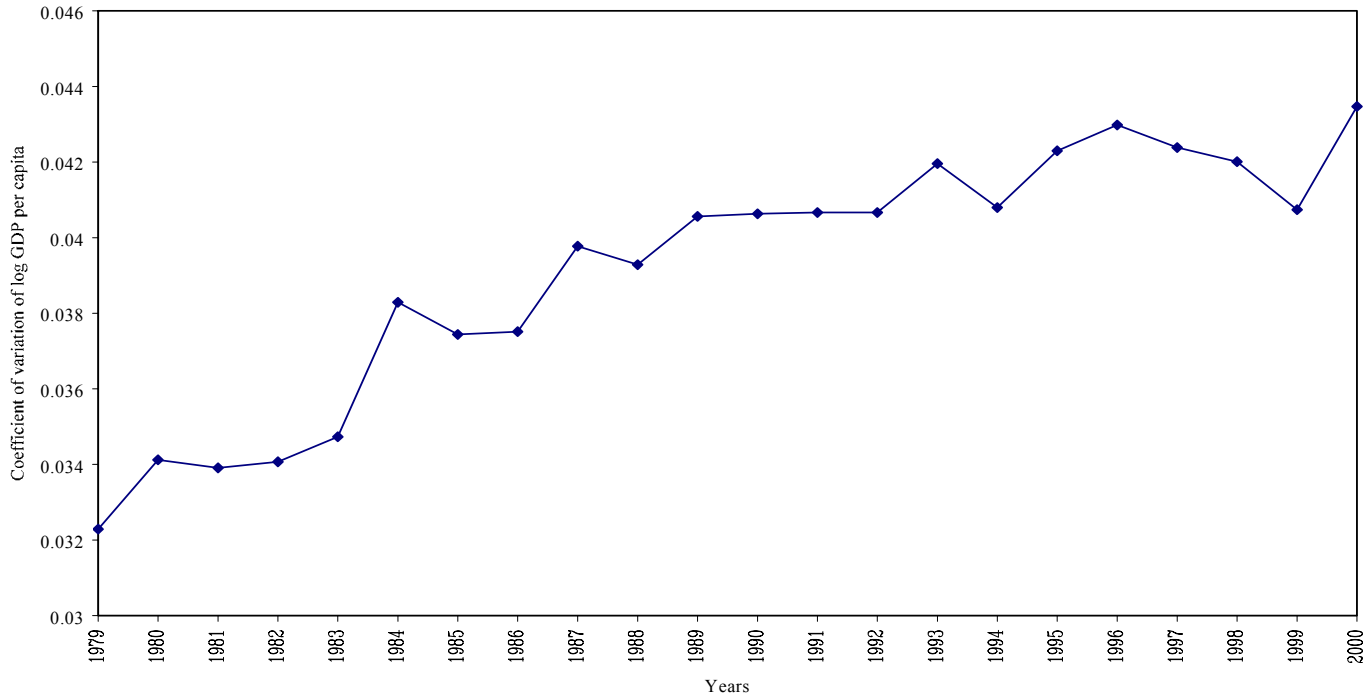
It is observed that the dispersion, sigma, increases steadily from 0,0308 in 1981 to 0,0346 in 1984. This increase indicates regional sigma divergence in terms of per capita income in the period **1980-1984**, corresponding to the first years after the initiation of the 1980 economic stabilization program, when regional and national per capita GDP did not indicate significant growth. As a result, per

Figure 3.5 Dispersion of log GDP per capita in Turkey, 1980-2000 (by geographical regions)



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

Figure 3.6 Evolution of Regional Disparities in Turkey, 1980-2000 (by geographical regions)



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

capita income became unequal between 1980-1984 among the regions of Turkey. After this, a general convergence trend set in the next ten-year period between **1984-1994**. Although there were one-year divergence periods, it is seen that the dispersion of regional per capita income tended to decline significantly from 0,0346 in 1984 to 0,0312 in 1994. As indicated before, between 1984 and 1987 was the period when incentives and measures to liberalize trade and increase exports were intensified; incentives were given to less developed regions defined as first and second priority areas; and the GAP project was initiated to stimulate the agricultural potential of the Southeastern Anatolia region. These policies and initiatives were reflected by significant increases in national and regional per capita GDP rates and led regional income disparities to diminish between 1984-1994.

A period of divergence followed this, until 2000 when sigma increased from 0,0312 in 1994 to 0,0339 in 1997 and to 0,0348 in 2000. Interestingly, despite the increase in both national and regional annual growth rates of per capita GDP after the 1994 economic crisis until 1997, it appears that regions in Turkey became increasingly unequal in terms of per capita income.

The above analysis of the evolution of regional inequalities in Turkey reveals that regional convergence in Turkey has exhibited a fluctuating trend. Despite these fluctuations, it is possible to talk about three periods concerning regional per capita income disparities in Turkey. The first period between 1980-1984 is a period of strong divergence in Turkey. This period was followed by a ten-year convergence period between 1984-1994. Recently, after 1994, however, regions in Turkey became increasingly unequal instead of converging in terms of their per capita incomes. It was the year 1994 that income differences among regions were the smallest. However, per capita income increasingly diverged, especially in the last five years of the analyzed period, when the dispersion rose to its highest level in 2000. In 2000, the dispersion of regional per capita income was much more (0,0348) than it was in 1984 (0,0346).

It should be mentioned, however, that the analysis of sigma convergence at the regional level might be somehow misleading. This is because the regions are not defined functionally but according to their climatic characteristics. Therefore, analysis of sigma convergence at the provincial level would give results that are more reasonable. The analysis will be done by using log GDP per capita of 65 provinces in Turkey. However, data at the provincial level is somehow problematic for Turkey in time-series studies. This is because of the changing number of provinces year by year. The number of provinces, which was 67 in 1980, was increased to 81 by 2000, with the definition of some previously sub-districts as provinces during 1990-2000. The creation of new provinces necessitated adjustments for GDP per capita data at the provincial level, between 1990 and 2000. The method used by Güngör (2001) is applied and GDP per capita figures are recalculated, by defining two composite provinces[6].

As expected, results of sigma convergence at the provincial level indicate different results (Table 3.6 and Figure 3.7). First, the period defined by strong convergence among geographical regions appears to be much longer at the provincial level. The prevailing process from **1980 to 1988** was divergence in terms of GDP per capita. Despite the fact that Turkey, in large part was overcoming the impact of the 1978-1980 crisis and was experiencing a period of growth, per capita income disparities at the provincial level was hardly improved. They even worsened after 1983, when Turkey experienced significant growth with the adaptation of the new economic program and intensification of incentives for increasing exports. This divergence can be attributed to the major industrial and growth policies of the period to liberalize trade and increase exports by using existing capacities.

[6] Composite provinces are defined for cases where a new province is created from subdistricts of several provinces. The first composite province comprises Hakkari, Mardin, Siirt and their previous sub-districts, which became the provinces of Batman and Şırnak in 1991. The second composite province contains Çankırı and Zonguldak and their previous sub-districts, which became the provinces of Karabük and Bartın in 1996.

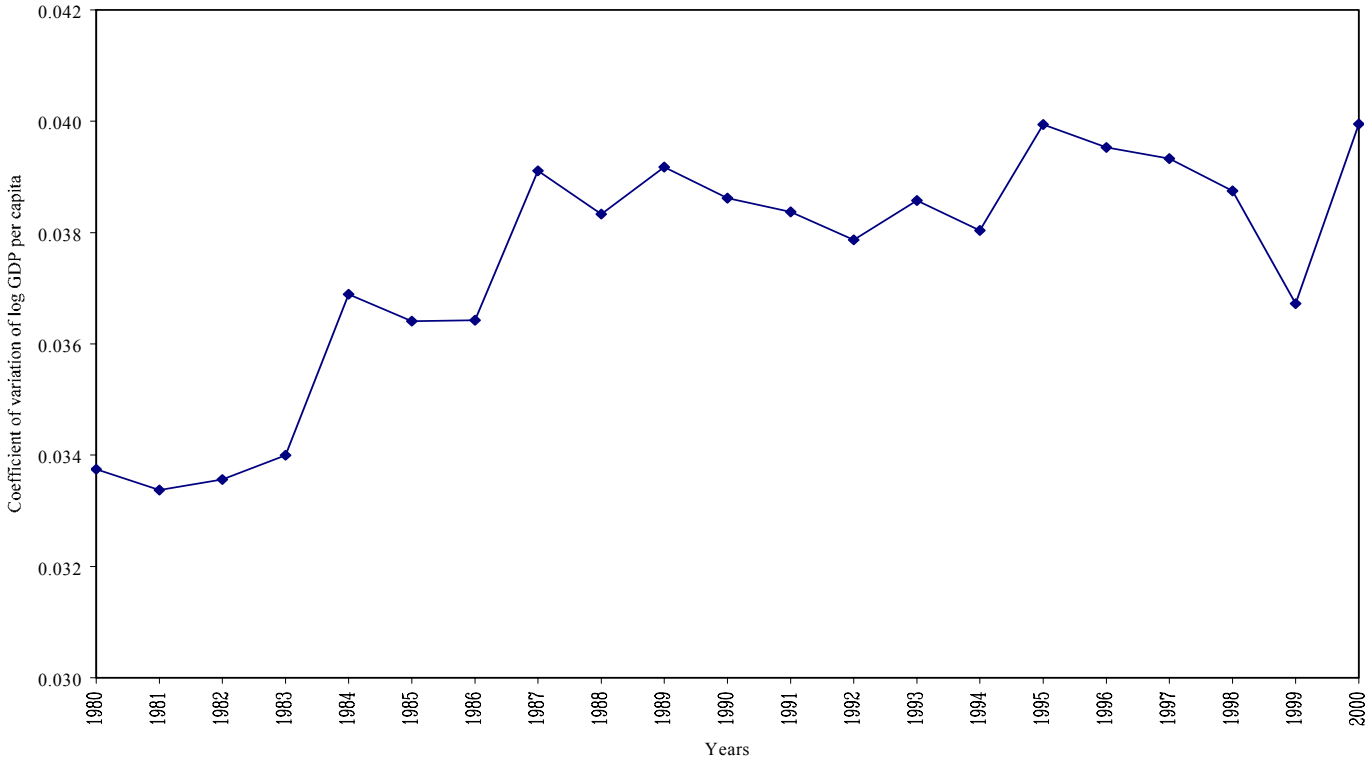
What took place over the six-year period between 1989 and 1995 was convergence for the first three years, **1989-1992**, when growth rates of per capita income growth indicated a fluctuating pattern. In marked contrast was the period **1992-1994**, when differences between provinces tended to worsen. To recall, this period coincided with declines in per capita income growth rates and subsequently with the collapse of the economy in 1994. It appears that the trend towards convergence that took place in the previous three years was interrupted. This change can be attributed to the general fall in the per capita growth rates of provinces.

Table 3.6 Summary Statistics for log GDP per capita, 1980-2000 (by provinces)

Years	mean	Standard deviation	Coefficient of variation
1979	5,95229	0,18779	0,03155
1980	5,93547	0,20030	0,03375
1981	5,94772	0,19850	0,03337
1982	5,95923	0,19999	0,03356
1983	5,94801	0,20221	0,03400
1984	5,95935	0,21985	0,03689
1985	5,96865	0,21731	0,03641
1986	5,98362	0,21795	0,03642
1987	6,00281	0,23476	0,03911
1988	6,00768	0,23030	0,03833
1989	6,00033	0,23508	0,03918
1990	6,02852	0,23282	0,03862
1991	6,02915	0,23134	0,03837
1992	6,04543	0,22894	0,03787
1993	6,06122	0,23381	0,03857
1994	6,04476	0,22992	0,03804
1995	6,05810	0,24199	0,03994
1996	6,08045	0,24035	0,03953
1997	6,10852	0,24024	0,03933
1998	6,12119	0,23719	0,03875
1999	6,10272	0,22411	0,03672
2000	6,09886	0,24366	0,03995

Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

Figure 3.7 Evolution of Regional Disparities in Turkey, 1980-2000 (by provinces)



Source: Based on the data from Özütün (1988) for the period 1980-1987 and SIS (2002) for the period 1987-2000

From **1995 to 1999**, the economic divergence process comes to a halt and the evolution of provinces in Turkey was characterized by a trend towards regional convergence. This trend coincided with the increase in average annual growth rates of per capita income in the first years after the 1994 crisis by 5 to 7 points, as well as a big financial crisis in 1998. The economic recovery period after the 1994 crisis obviously led to the improvement of differences between provinces in terms of per capita income. In 1998, on the other hand, the reflections of the Asian crisis and later the Russian crisis started to affect the Turkish economy. Export activity as well as investments declined significantly coupled with a significant financial decline in the Turkish economy. The financial crisis had serious negative effects on the metropolitan regions of the country, which resulted with increasing unemployment of the white-collars and to the decline of per capita income.

So, the per capita income convergence among provinces in Turkey in the 1995-1999 period was not only because of increasing growth rates of per capita income in the first years of the period, but also because of the decline of per capita income in the metropolitan regions of Turkey since 1998. However, the figure shows that from 1999, concerning regional per capita income convergence, the situation worsened again, resulting once more with an increase in per capita income disparities.

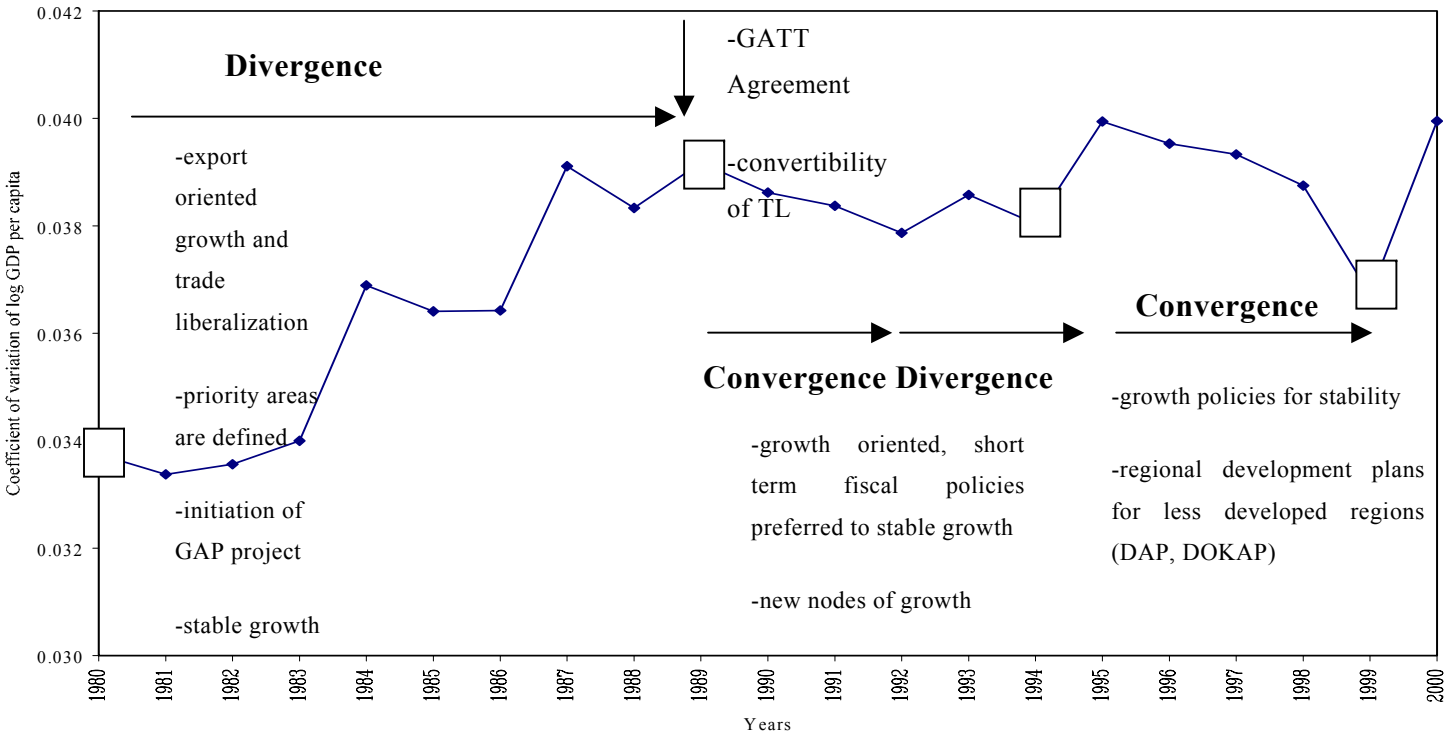
Overall, the results of the analysis of sigma convergence among the provinces of Turkey between 1980 and 2000 would seem to indicate that the evolution of per capita income disparities among the provinces fluctuates over the investigated period. Table 3.7 and Figure 3.8 summarize the evolution of per capita income disparities and the economic characteristics of Turkey in different periods between 1980 and 2000 and. It should be noted, however, that this attempt is not supposed to mean that the evolution of regional income disparities in Turkey is because of these economic issues summarized. Obviously, this is a complex issue behind which there are not only economic reasons but also social, political and other reasons. On the other hand, the Turkish economy is characterized by crisis conditions. Especially after the

Table 3.7 Characteristics of Different Periods of Economic Growth in Turkey, 1980-2000

Periods of Income Growth	Major Policies and Policy Measures	Implications on Regional Growth	Implications on per capita Income growth
1980 Economic Stabilization Program			
1980-1988	Export oriented growth and trade liberalization -subsidies and incentives to export sectors -withdrawal of public investment on manufacturing -increase in exports by the effective use of existing capacities -exports based on cost advantages -public investment on transportation, energy and communication sectors -private investment on tourism and housing activities	-metropolitan centers as major growth areas and trade nodes and regions at their near periphery through decentralization process -substantial growth of regional centers as well as coastal areas -incentives for less developed areas in East Anatolia and Black Sea (priority areas) -investments to stimulate the potential of Southeast Anatolia region to transform it to an export center; GAP project in 1987	-increase in the annual growth rate of per capita income -increasing per capita income disparities among provinces
1988-1989 crisis			
1990-1992	-growth oriented, short-term fiscal policies preferred to stabilization -elimination of export incentives and subsidies due to the GATT agreement		-fluctuations in per capita income growth rates -decreasing per capita income disparities among provinces
1992-1994	- growth oriented, short-term fiscal policies preferred to stabilization	-increasing growth of metropolitan regions -growth of some provinces previously defined as priority areas (Çorum, K.Maraş, Malatya, Tokat) -new growth nodes: growth of previously less developed areas based on their local capacities (Denizli, Gaziantep, Kayseri, Konya)	-fluctuations in per capita income growth rates -increasing per capita income disparities among provinces
1994 crisis			
1995-1999	-growth policies for stability	-sustainable development of less developed areas based on their existing opportunities and local resources; regional development plans for East Anatolia and East Black Sea regions	-increase in per capita income growth rates but decline in GDP shares -decreasing per capita income disparities among provinces
1999 crisis			

Source: Author's own elaboration

Figure 3.8 Characteristics of Different Periods of Economic Growth and the Evolution of Income Disparities in Turkey, 1980-2000



Source: Author's own elaboration

1990s, financial crises dominated the national economy, which resulted in serious declines in the growth of the most advanced areas of the country. Besides, these regions are where the economic activities and population are concentrated. Then, any trend towards sigma convergence is more the result of the underperformance of the metropolitan core regions because of crisis conditions and the over concentration of population due to migratory movements than being the result of the well performance of relatively lagging regions. Most of the time forces towards convergence appear to be on the foreground when the economically advanced regions are doing badly but not when they grow faster. In short, the trend towards declining per capita income disparities might hide the persisting per capita income differences among the provinces of Turkey. Obviously, policies since 1980 favored the areas with industrial capacities and experience, which led them to develop as export centers, as well as the ones with tourism and agricultural potentials. Metropolitan centers of Istanbul, Izmir and Ankara together with their hinterland provinces appeared as areas where industrial activities were agglomerated and as gateways for trade. Some provinces in the southern coast, such as Antalya and Mersin, became attractivedue to tourism activities. On the other hand, some provinces in the Southeastern Anatolia such as Gaziantep and K.Maraş appeared as regional growth centers because of the GAP area with their agricultural and some manufacturing potentials.

However, apart from the two relatively successful provinces of Gaziantep and K.Maraş, most of the areas in the eastern and northern part of Turkey, without local capacities and experiences and with limited natural resources appeared not to get the advantage of trade liberalization and export opportunities. Despite the incentives defined for the least developed regions and regional development projects, these areas could not respond to the rapid changes and dynamic developments taking place since 1980. The result is the intensification of income differences between the metropolitan regions, which dominate the economy and loser regions with very limited capacities and resources. It is this dualism, which necessitates a detailed examination of the forces and initial conditions behind this income gap among the provinces of Turkey.

CHAPTER 4

TOWARDS AN EXPLANATION OF REGIONAL INCOME GROWTH DIFFERENCES IN TURKEY

After the close investigation of trends in per capita income convergence among Turkish provinces, at this point, it is important to examine the forces and initial conditions behind the persisting income gap among the provinces of Turkey since 1980. Two questions arise as to the causes of income growth rate differences. First, to what extent the trend of income growth differences across provinces towards convergence is related with initial per capita income differences of provinces in Turkey. This is related with the examination of the evolution of per capita income growth gaps and its relationship with initial income gaps. Such an analysis is important since it explores whether regions showing higher per capita income growth gaps are the ones that had the lowest initial per capita income disparities. Second, to what extent differences in regional income growth performances can be explained by differences in regional human capital performances. This is related with the investigation of income growth convergence when conditioned on human capital variables. The analysis of beta convergence in this section will aim to answer these questions.

4.1 Beta Convergence of Income per capita in Turkey

In Chapter 2, the literature on beta convergence was examined in detail. To recall and give a brief summary of it, there are two basic views prevailing in the convergence literature concerning beta convergence. First one, the catch-up model, bases its arguments on the advantages of falling behind and argues that

poorer economies tend to grow faster than richer ones (Abramovitz, 1994; Baumol, 1986; Verspagen, 1994). The second view, on the other hand emphasizes the advantages of being rich and highlights the factors that contribute to faster growth of more advanced economies (Aghion and Howitt, 1992; Grossman and Helpman, 1990; Lucas, 1988; Romer, 1986, 1990).

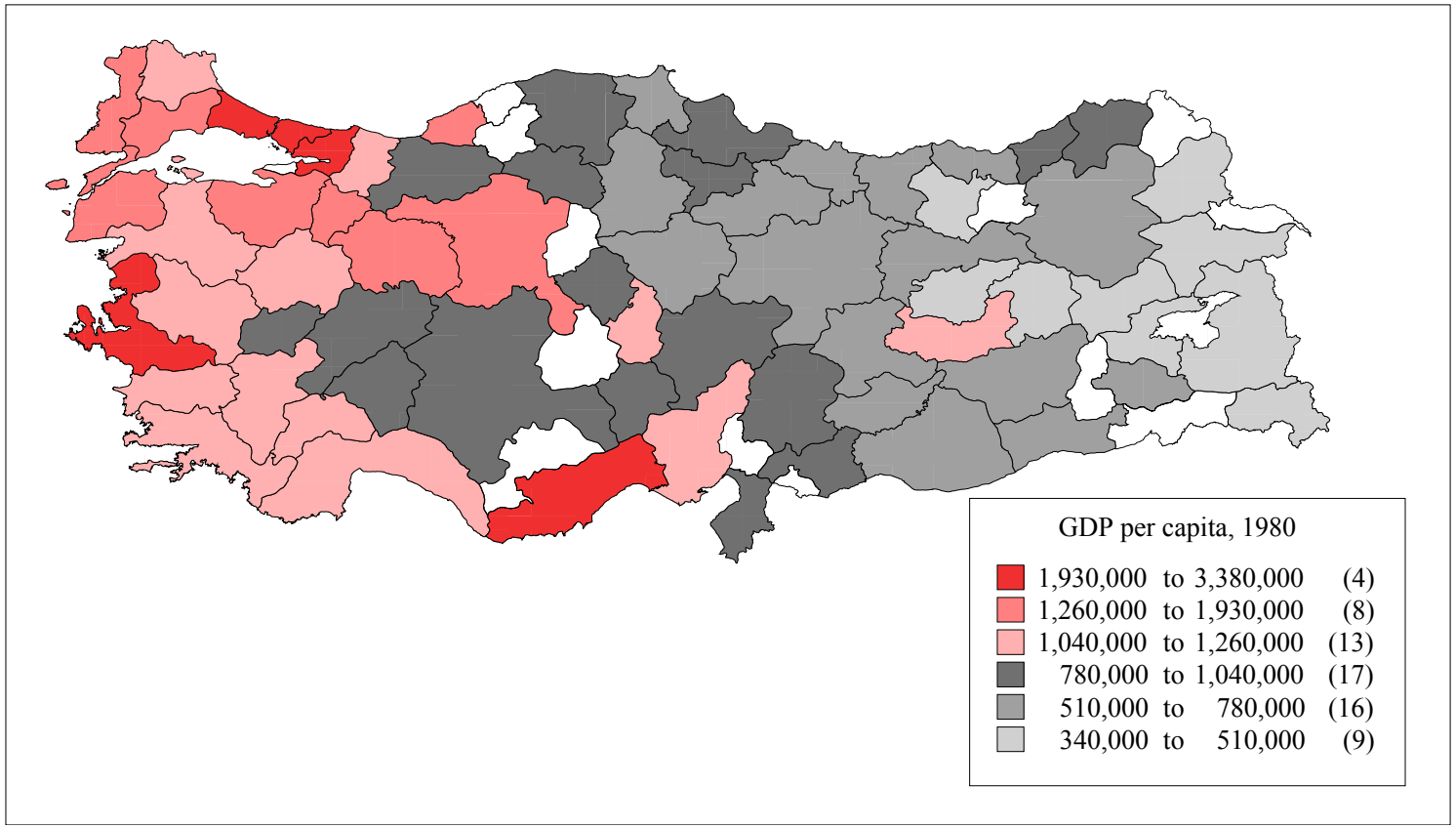
Despite these differences, what is common in the recent convergence literature is that beta convergence implies inverse relation between the initial level of per capita income and its rate of growth in a cross section of regions. In other words, the study of beta convergence attempts to show whether economies with initially lower per capita income levels tend to have higher rates of growth than those which started with higher per capita income levels, therefore catching up with the latter (Cuadrado-Roura, 2000).

Based on this definition, two measures of beta convergence, absolute and conditional, are distinguished. Absolute convergence is based on the supposition that economic structures of regions do not differ considerably and refers to the proposition that poorer economies grow faster than richer ones unconditionally and reach the same equilibrium value. Whereas conditional convergence infers that economic structures of regions vary significantly and thus convergence to the same equilibrium path does not necessarily take place. It implies that growth rates of economies converge when controlled for variables affecting growth. Test for beta convergence, in this section, in terms of per capita income levels in Turkey will be based on these two definitions.

The beta convergence equation will be estimated with cross-section data for 64 provinces over the period 1980-2000[1]. The estimated equation will help us to explain trends in regional income convergence in Turkey. Map 4.1 and Map 4.2 give a preliminary idea about the relationship between initial per capita income levels of provinces in Turkey and their growth rates between 1980 and 2000. It

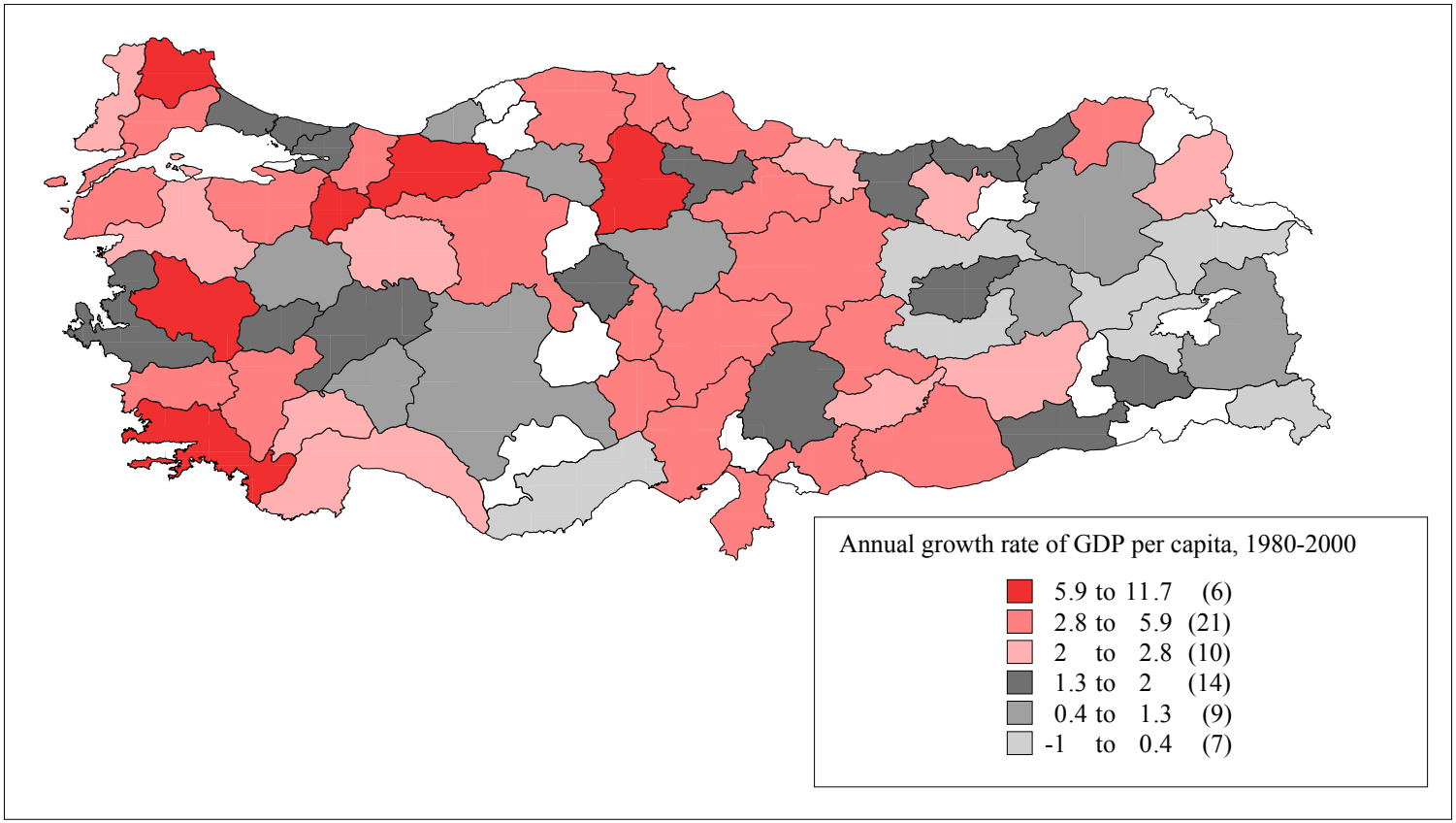
[1] Discussion on beta convergence was covered in Chapter 2.

Map 4.1 Spatial Distribution of GDP per capita in Turkey (TL), 1980



Source: Based on the data from Özütün (1988)

Map 4.2 Spatial Distribution of the Annual Growth Rate of GDP per capita in Turkey (%), 1980-2000



Source: Based on the data from Özütün (1988) and SIS (2002)

seems from the first map that the major metropolitan centers of the country, İstanbul, Kocaeli, İzmir and İçel had the highest income per capita levels in 1980. These centers are followed, in terms of per capita income levels, by the provinces located at the periphery of them and close to the major transportation axes (Ankara, Bursa, Eskişehir, Tekirdağ), whereas those located in the eastern part of Turkey had the lowest per capita income levels at the beginning (Ağrı, Bingöl, Bitlis, Muş). When the second map is investigated in relation to the first one, it is seen that the four richest provinces in 1980 have relatively lower growth rates and seem to prove the convergence hypothesis. However, as opposed to the convergence hypothesis, the poorest provinces, most of which were located in the eastern part of the country appear not to have grown that fast. Yet, their per capita incomes have tended to decline. On the other hand, some provinces located in the west part of Turkey, whose per capita income was in the third highest range (1,040,000-1,126,000TL) and some provinces in the Central Anatolia and northern Turkey, which had relatively lower per capita income levels in 1980 (780,000-510,000TL), tended to have quite high rates of growth.

It seems that, for Turkey, the regional convergence process is rather complicated. The next chapter will first, analyze in detail the relation between initial income levels and the growth rate of income and second, explore the contribution of human capital differences to explain regional per capita income growth convergence patterns.

4.1.1 Absolute Beta Convergence

While analyzing beta convergence in terms of per capita income levels, annual growth rate of per capita GDP of provinces is regressed on the initial level of per capita GDP. The equation to estimate absolute beta convergence can be written as:

$$1/t*\log (Y_{it}/Y_{it0}) = \alpha_i + \beta_1 * \log Y_{it0} + \varepsilon_{it} \qquad \text{Equation (1)}$$

This equation may also be expressed as:

$$1/t^* (\log Y_{it} - \log Y_{it0}) = \alpha_i + \beta_1 * \log Y_{it0} + \varepsilon_{it}, \qquad \text{Equation (2)}$$

where, $1/t^* \log (Y_{it}/Y_{it0})$ is referred to as the annual growth rate of per capita GDP of province i at time t and can be symbolized by ΔY_{it}, $\log Y_{it0}$ is the log of per capita income of province i at the beginning of the period under analysis. Assuming other things constant, ε_{it} is the disturbance term, which encapsulates the influence of neglected variables and statistical errors. A negative β_1 value in this equation implies a negative correlation between growth rate and initial income, which indicates beta convergence.

A first analysis of the relation between initial per capita GDP gaps and growth rate differences of provinces in Turkey will depend on a revised version of this basic equation used by Cuadrado-Roura et al. (2000) and Cuadrado Roura (2001). If we take averages of the second equation, the equation becomes:

$$1/t^* (\log \bar{Y}_t - \log \bar{Y}_{t0}) = \alpha_i + \beta_1 * \log \bar{Y}_{t0} + \bar{\varepsilon}_{it} \qquad \text{Equation (3)}$$

This equation gives the average income growth rate of Turkey as a function of its income level in the initial year under analysis. Calculating the difference between equations (2) and (3), we arrived at the equation:

$$\Delta Y_{it} - \bar{\Delta} Y_t = \beta_1 * (\log \bar{Y}_{t0} - \log Y_{it0}) + v_{it}, \qquad \text{Equation (4)}$$

To estimate absolute beta convergence of GDP per capita growth with cross-section data, the equation can be written as:

$$\Delta Y_{it} - \bar{\Delta} Y_t = \beta_{0i} + \beta_1 * (\log \bar{Y}_{t0} - \log Y_{it0}) + v_{it}, \qquad \text{Equation (5)}$$

or

$$\Delta Y_{it} - \bar{\Delta} Y_t = \beta_{0i} - \beta_1 * (\log Y_{it0} - \log \bar{Y}_{t0}) + v_{it}, \qquad \text{Equation (6)}$$

where $\bar{\Delta} Y_t$ indicates average per capita GDP growth rate of the nation between time t and time t_0 and $\log \bar{Y}_{t0}$ refers to the log average per capita GDP of the nation at the beginning of the analyzed period. β_1 shows the

tendency for the provinces of Turkey to converge to the GDP per capita level of the national average (Chatterji and Dewurst, 1996). In the revised equation, which will be used in this chapter, the difference of per capita income growth rate between the nation and the province depends on the difference of the initial level of per capita income between that of the province and the nation. In equation (5), β_1 value significantly greater than zero implies that convergence exists (Cuadrado et al., 2001). Then, for equation (6), the estimated β_1 coefficient smaller than zero will indicate that convergence took place in the analyzed period.

The analysis is firstly preceded for the period 1980-2000 and for the 4 sub-periods, previously defined in the analysis of sigma convergence, namely 1980-1989, 1989-1992, 1992-1995 and 1995-1999. However, since the sub-periods were comprised of very short time periods, an analysis of convergence was not meaningful. Yet, although significant at 5% level, the ability of initial income gap to explain income growth gap was very low (around 4%) for the sub-periods. Although, as Ramanathan (1998:333) said, cross-section studies typically have low R^2, R^2 values around 4% were still unimpressive. Then, the analysis is preceded for the 1980-2000 period with linear model and with quadratic and cubic models.

Table 4.1 gives the results of the regressions. The values indicate that the beta coefficient is statistically significant at 5% level and initial income difference explains 11% of the variation in income growth differences[2]. The resulting beta coefficient significantly greater than zero implies that over the period between 1980-2000, as a whole there was no tendency for per capita GDP growth of provinces to converge to the national average. In fact, the trend is rather the

[2] Econometricians agree that cross-section studies typically have low coefficient of determination values (Ramanathan, 1998). On the other hand, there are examples in the literature that accept lower R^2 values. For example, Cuadrado-Roura et al. (2000) accepted an adjusted R^2 value of 0,04031 for the unconditional model and 0,061618 for the fixed-effects model; Cuadrado-Roura (2001) accepted values around 0,0218 for the unconditional convergence model and 0,18 for the conditional convergence model and lastly Cuadrado-Roura et al. (1999) accepted values 0,106 for the standard convergence equation and 0,187 for the augmented equation.

Table 4.1 Results of Absolute Beta Convergence Analysis

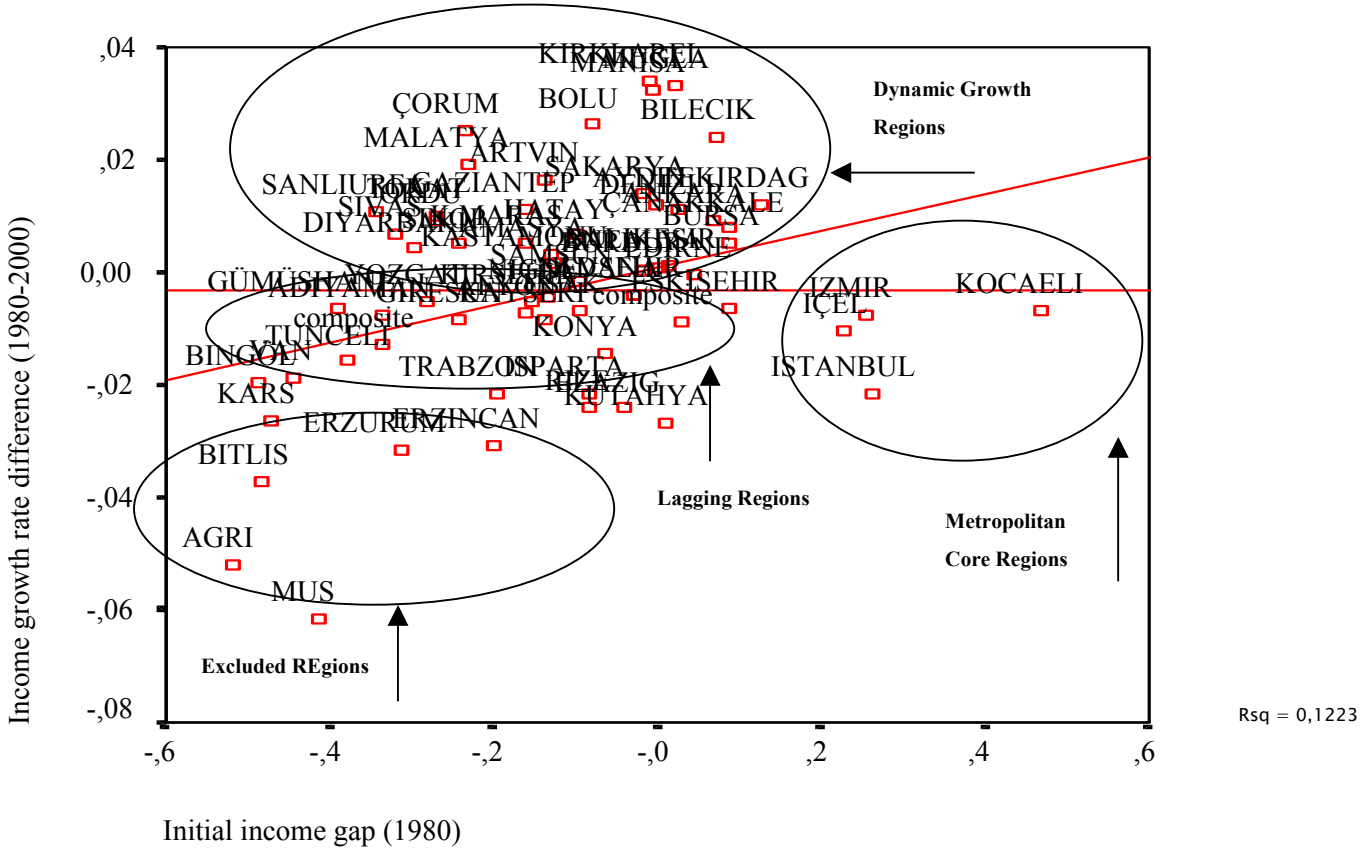
Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$						
	Model 1 (Linear)		**Model 2 (Club 1)**		**Model 3 (Club 2)**	
Independent variables	Coefficient (s.e)	Sig. t	Coefficient (s.e)	Sig. t	Coefficient (s.e)	Sig. t
Constant	0,000752 (0,002620)	0,7749	0,0078 (0.002)	0.001	-0,0086 (0.004)	0.047
$\log Y_{it0} - \log^{-} Y_{t0}$	0,032960 (0,011216)	0,0046	-0.026 (0.011)	0.026	0,041 (0.015)	0,009
R^2	0,122		0,142		0,224	
Adjusted R^2	0,108		0,116		0,196	
Standard error	0,017		0,012		0,013	
d.f.	1		1		1	
F	8,63588		5,443		7,813	
Sig. F	0,0046		0.026		0.009	

reverse, GDP per capita growth in provinces showed a tendency to fall behind the national average. Figure 4.1 gives the scatter plot of the growth rate differentials in terms of per capita GDP for the analyzed period versus the log initial per capita GDP gap. When we look at the figure, it is possible to define four groups of regions for the period 1980-2000 in terms of initial income levels and growth performances of provinces.

The first group is composed of provinces, which situated in the down right part of the figure. High levels of per capita income at the beginning of the analyzed period and growth rates lower than the national average characterize this group of provinces (İçel, İstanbul, İzmir and Kocaeli). These provinces may be defined as the most dynamic metropolitan regions of Turkey and with their considerably high initial income levels and relatively lower income growth rates they appear to behave in the way predicted by the convergence model.

Apart from the economically most dynamic group of provinces (Group 1), there appear to be a second group, which is composed of provinces with initial income levels lower than or relatively closer to the national average, and growth performances superior to that of the nation. These provinces are positioned in the top center part of the figure. Among these provinces are, on the one hand those, which are located in proximity to metropolitan areas along with the main transportation axes and gateways of export activity (Ankara, Bolu, Bursa, Kırklareli, Manisa, Sakarya, and Tekirdağ). These regions function as hinterlands of core regions and may be benefited from the spread effects. On the other hand, there are regions, which are defined as success stories of Turkey, which followed a self-development path focusing on their local capacities after 1980s (Çorum, Denizli, Gaziantep, K.Maraş), as well as the big provinces of the southeastern part of Turkey (Diyarbakır, Mardin, Ş.Urfa). It would seem reasonable to say that some group of provinces showed a renewed dynamism and a capacity for achieving successful growth by activating their local capacities, which is reflected by their growth rates above the national average. It seems that these regions responded more rapidly to

Figure 4.1 Scatterplot of Income Growth Rate Differences (1980-2000) by Initial Income Gaps (1980)



sudden and incremental changes, which were intensified after 1980s. They seem to be more capable of taking advantage of integrating to the world markets and of widening competition, reflected by per capita income growth rates superior to the national average.

Despite this increase in the number of economically dynamic regions, there are a considerable number of provinces that compose the third group, which may be defined as regions with a low initial income level, and with growth rates lower than the national average. This group mostly consists of provinces of the eastern and the northern part of Turkey (Adıyaman, Bingöl, Elazığ, Kars, Tunceli, Van and Giresun, Gümüşhane, Rize, Samsun, Trabzon, respectively), although included are some provinces located in other parts of Turkey (Afyon, Isparta, Kayseri, Konya, Niğde, Uşak, Yozgat). These areas are geographically more peripheral and economically backward. They are not effective in activating their resources and capacities. Unlike the Group 2 provinces, integration to the more competitive markets enlarged the gap between these economically backward regions and the nation. It seems that when the metropolitan regions grew faster and a number of provinces took the advantage of increasing competitiveness, these regions suffered more from the competitiveness of the economy and from other regions taking advantage of new opportunities (Camagni, 1992) and the differences between these lagging regions and the rest of the country has increased.

Lastly, the fourth group consists of a few provinces, which stand distinct from those of the third group with their extremely low initial income levels and income growth rates (Ağrı, Bitlis, Erzincan, Erzurum and Muş). They have had growth rates much below the national average. The gap of their initial income and income growth rate from the national average are –0.20 and –0.03 or more, respectively. It seems that these areas have faced serious problems in terms of their local capacities and resources, signaling their exclusion from the rest of the country. The problem of these regions is more than activating their resources and capacities but they do not even have them.

Among these four different groups of provinces, the analyses undertaken so far signals a persisting dualism between a group of dynamic provinces with per capita income growth rates superior to the national average (Group 1 and Group 2), as opposed to a group of provinces with low initial income levels and income growth rates (Group 3 and Group 4)[3]. As previously mentioned, the results of convergence analyses may be misleading when an economy indicates a dualistic structure[4]. Consequently, for our case, it might be that income growth disparities tended to increase between the two quite distinct groups of provinces in the period 1980-2000 when in fact; provinces within each group might indicate a tendency towards convergence to the national average income growth rate.

To take into account these points, beta convergence analysis is preceded for two distinct clubs of provinces. The first club is defined as the group of provinces, which had per capita income growth rates superior to that of the nation in the analyzed period (1980-2000), accompanied by per capita income levels higher than or lower than the national average at the beginning of the period of analysis. Therefore Club 1 is defined as the combination of the provinces of Group 1 and Group 2. The second club, on the other hand consists of provinces, which started with smaller than average income levels in 1980 and indicated income growth rates between 1980-2000 lower than the national average. In other words, Club 2 is defined to be composed of the provinces of Group 3 and Group 4.

Table 4.1 gives also the results of absolute beta convergence for the first club of provinces and for the second club of provinces. The beta value of –0,026 for Club 1 indicates that per capita income growth differences among the provinces of this group tended to converge to the national average in the period 1980-2000. The absolute beta convergence equation is significant at 5% level, with a 12% adjusted R^2 value.

[3] The convergence analysis is preceded by excluding the provinces of Group 1 and Group 4 as extreme cases. The results indicated divergence again, however the explanatory power of the model declined.

[4] See Chapter 2 for the discussion on convergence clubs.

Figure 4.2 gives the scatter plot of per capita income growth disparities among the provinces of the first club. The figure clearly points to only a few provinces (İçel, İstanbul, İzmir and Kocaeli), which, with significantly higher than the average initial income levels, demonstrated lower than average income growth rates. It seems that only the metropolitan provinces, which have dominated the national economy behaved the way predicted by the absolute convergence hypothesis. It is worth recalling once again that these provinces are faced with the negative effects of cumulative processes of economic growth. The concentration of population through migratory movements from all over the country as a consequence of the agglomeration of economic activities decreases the income growth performance of these areas. On the other hand, a considerable number of provinces with initial income levels close to or substantially lower than the national average indicated considerably higher rates of per capita income growth than the national average. The result was a decline in per capita income growth disparities within this dynamic club of provinces in the period 1980-2000.

However, as of the second group of provinces with lower than average per capita incomes at the beginning of the analyzed period and substantially lower than average income growth rates, Table 4.1 indicates divergence with a beta value of 0,041. The linear convergence equation is significant at 5% level with a 20% adjusted R^2. Figure 4.3 illustrates that provinces of the second club, which had quite low levels of per capita income relative to the national average in 1980 indicated a tendency towards divergence from the national income growth rate. On the other hand, it is seen from the figure that there are some provinces within the relatively disadvantaged club that stand quite distinct in terms of their initial income conditions and income growth rates. Yet, almost half of the provinces within this group indicated income growth rates quite lower than the group average (-0.017).

In order to analyze the differences between the two quite distinct clubs (Club 1 and Club 2) in detail, analysis of variance technique is applied. The results of One- Way Anova between Club 1 and Club 2, depicted by the Table 4.2,

Figure 4.2 Scatterplot of Income Growth Rate Differences (1980-2000) and Initial Income Gaps (1980) for Club 1

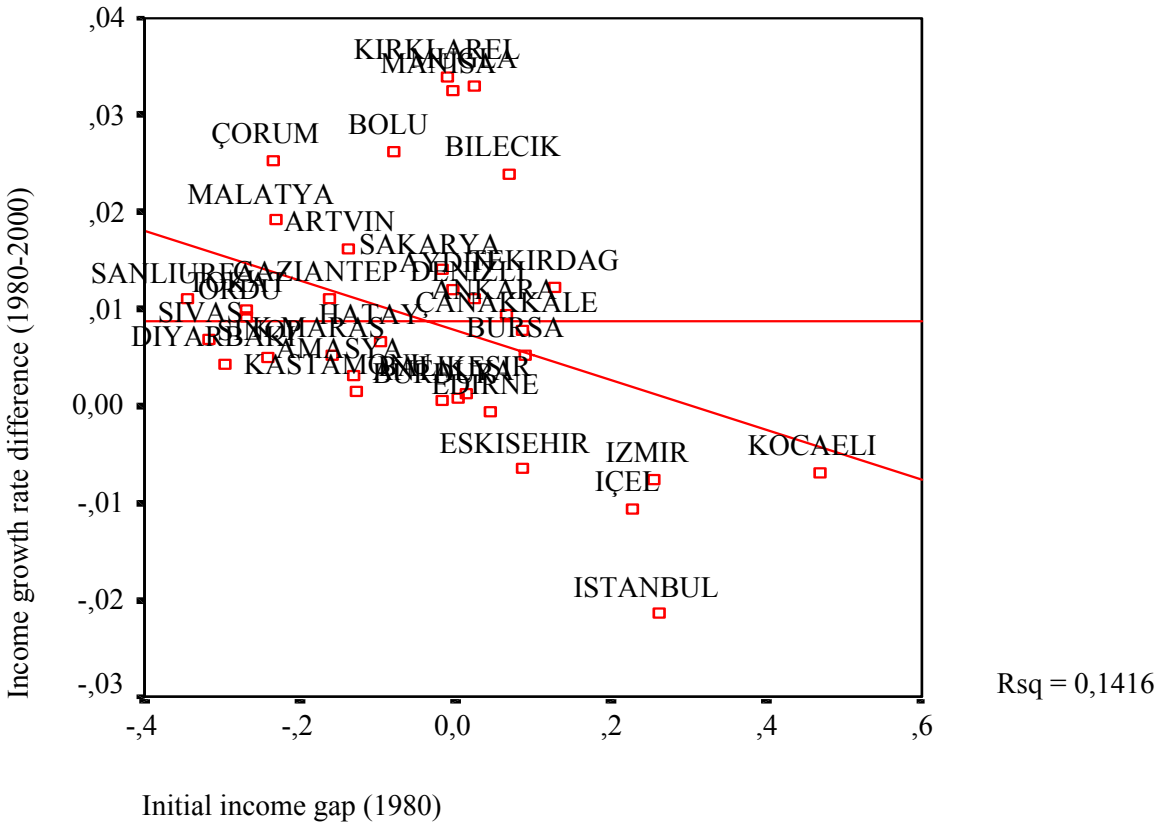
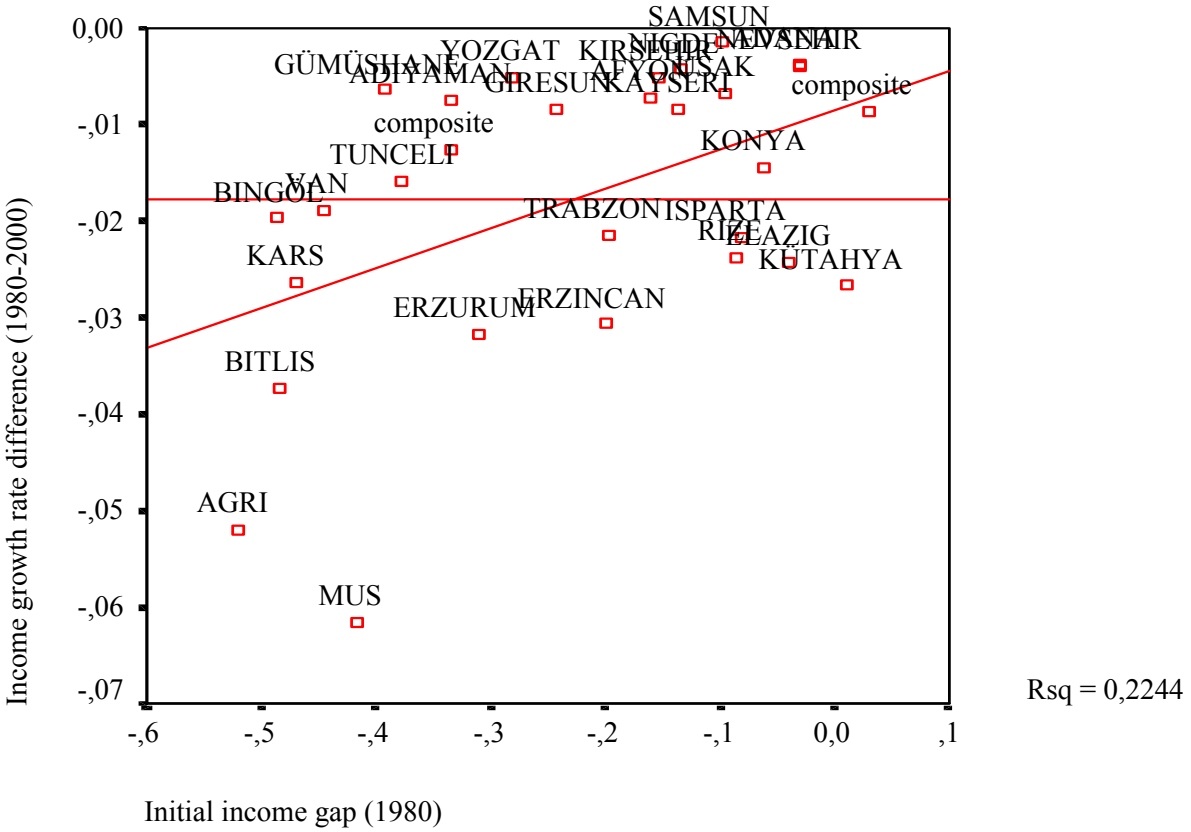


Figure 4.3 Scatterplot of Income Growth Rate Differences (1980-2000) and Initial Income Gaps (1980) for Club 2



Rsq = 0,2244

Table 4.2 Results of One-Way Anova (1)

Descriptives

			N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Initial income gap, 1980	CLUB	1	35	-.0370	.1839	.0311	-.3435	.4699
		2	29	-.2263	.1701	.0316	-.5196	.0288
		Total	64	-.1228	.2003	.0250	-.5196	.4699

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Initial income gap, 1980	Between Groups	.568	1	.568	17.971	.000
	Within Groups	1.960	62	.032		
	Total	2.528	63			

Table 4.2 Results of One-Way Anova (1) (continued)

Descriptives

			N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Initial income gap, 1980	CLUB	1	35	-.0370	.1839	.0311	-.3435	.4699
		2	29	-.2263	.1701	.0316	-.5196	.0288
		Total	64	-.1228	.2003	.0250	-.5196	.4699

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Initial income gap, 1980	Between Groups	.568	1	.568	17.971	.000
	Within Groups	1.960	62	.032		
	Total	2.528	63			

indicate that there is a statistically significant differentiation between the former, which indicated a tendency towards converging to the national average and the latter, the relatively disadvantaged group of provinces, in terms of initial income gaps and income growth rate differences. This finding signals increasing disparities between the two quite distinct clubs of provinces.

In order to test whether those provinces, which stand distinct from other provinces of Club 2, as appeared in Figure 4.3 the analysis of variance is applied by taking the four groups of provinces as the independent variable. Table 4.3 gives the results, where Club 1_1 and Club 1_2 are comprised of the provinces of Group 1 and Group 2, respectively; Club 2_1 and Club 2_2 are comprised from Club 2 by taking the provinces with initial income gaps and income growth rate differences higher than the group average as Club 2_1 and lower than the group average as Club 2_2. The results indicate that initial income gaps and income growth differences differ by these three groups of provinces and the variation observed in the group means is significant. It appears statistically that there are differences not only between the two quite distinct clubs of provinces but also within the relatively disadvantaged club (Club 2). This finding obviously gives the warning sign for these provinces of having been excluded not only from the rest of the country but even from the ones with somehow similar initial income levels and income growth rates.

The convergence analysis undertaken for the two distinct groups of provinces pointed that these two groups of provinces have behaved in a different way and indicated different convergence patterns in the period 1980-2000. Furthermore, there are some provinces within the relatively disadvantaged group, which tended to diverge not only from the successful growth regions but also from those provinces of similar characteristics. On the other hand, there are examples of the work on convergence clubs, which take into consideration, in the model, the existence of more clubs by including powers of initial income gap (Chatterji and Dewurst, 1996). Such an attitude, obviously, recognizes the complexity of the issue. For this aim, the analysis is preceded with quadratic and cubic models.

Table 4.3 Results of One-Way Anova (2)

Descriptives

			N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Initial income gap, 1980	CLUB	1_1	4	.3038	.111728	.0559	.2276	.4699
		1_2	31	-.0810	.139935	.0251	-.3435	.1271
		2_1	24	-.1930	.159801	.0326	-.4859	.0288
		2_2	5	-.3861	.130811	.0585	-.5196	-.2005
		Total	64	-.1228	.200300	.0250	-.5196	.4699

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Income growth rate difference, 1980-2000	Between Groups	.0168	3	.0056	58.727	.000
	Within Groups	.0057	60	.0001		
	Total	.0225	63			

Table 4.3 Results of One-Way Anova (2) (continued)

Descriptives

			N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Income growth rate difference, 1980-2000	CLUB	1_1	4	-.0116	.0068	.0034	-.0215	-.0069
		1_2	31	.0113	.0105	.0019	-.0065	.0340
		1_3	24	-.0126	.0082	.0017	-.0267	-.0015
		1_4	5	-.0427	.0136	.0061	-.0615	-.0307
		Total	64	-.0033	.0189	.0024	-.0615	.0340

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Initial income gap, 1980	Between Groups	1.247	3	.4156	19.472	.000
	Within Groups	1.281	60	.0213		
	Total	2.528	63			

Table 4.3 Results of One-Way Anova (2) (continued)

Multiple Comparisons

Dependent Variable: Initial income gap, 1980

LSD

(I) CLUBS4	(J) CLUBS4	Mean Difference (I-J)	Std. Error	Sig.
club 1_1	club 1_2	.3848*	.0776	.0000
	club 2_1	.4968*	.0789	.0000
	club 2_2	.6899*	.0980	.0000
club 1_2	club 1_1	-.3848*	.0776	.0000
	club 2_1	.1120*	.0397	.0065
	club 2_2	.3051*	.0704	.0001
club 2_1	club 1_1	-.4968*	.0789	.0000
	club 1_2	-.1120*	.0397	.0065
	club 2_2	.1931*	.0718	.0093
club 2_2	club 1_1	-.6899*	.0980	.0000
	club 1_2	-.3051*	.0704	.0001
	club 2_1	-.1931*	.0718	.0093

*. The mean difference is significant at the .05 level.

Multiple Comparisons

Dependent Variable: Income growth rate difference, 1980-2000

LSD

(I) CLUB	(J) CLUB	Mean Difference (I-J)	Std. Error	Sig.
club 1_1	club 1_2	-.0230*	.005	.000
	club 2_1	.0010	.005	.850
	club 2_2	.0310*	.007	.000
club 1_2	club 1_1	.0230*	.005	.000
	club 2_1	.0240*	.003	.000
	club 2_2	.0540*	.005	.000
club 2_1	club 1_1	-.0010	.005	.850
	club 1_2	-.0240*	.003	.000
	club 2_2	.0300*	.005	.000
club 2_2	club 1_1	.0010*	.007	.000
	club 1_2	.0310*	.005	.000
	club 2_1	.0230*	.005	.000

*. The mean difference is significant at the .05 level.

The results in Table 4.4 indicate that the model is significant at 5% level and the capacity of initial income gap to explain the variation in income growth differences increased from 11% to 26% when the quadratic model is used. However, the adjusted R^2 does not increase considerably when the cubic model is used further (27%). Then the relationship can be written as:

$$\Delta Y_{it} - \Delta^{-} Y_t = 0{,}0054+0{,}1311^* (\log Y_{it0} - \log^{-} Y_{t0})-0{,}0045^*$$

$$(\log Y_{it0} - \log^{-} Y_{t0})^2 + 0{,}0163$$

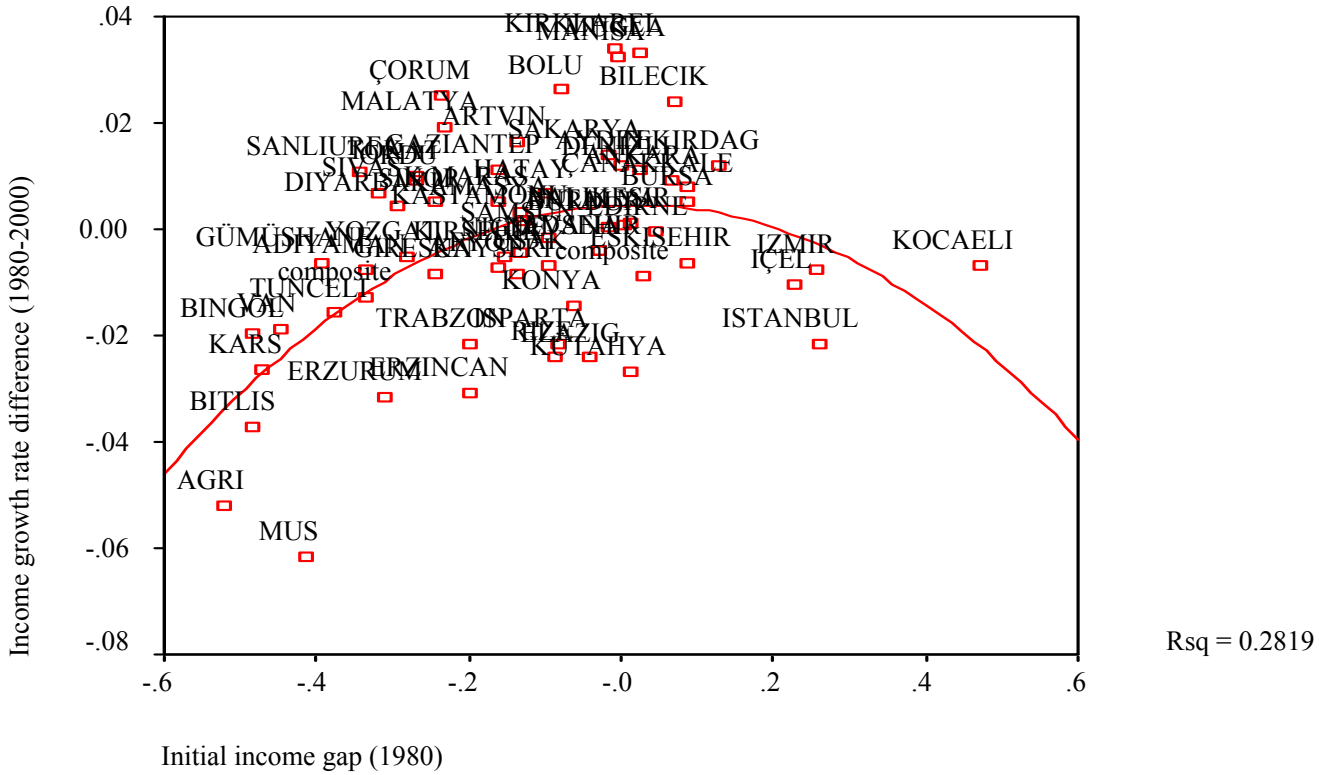
Obviously, these results indicate that the relationship between initial income gaps between provinces in Turkey and income growth differences over the period 1980-2000 is more complicated to be analyzed by a linear model. It appears that different provinces in Turkey indicate different convergence trends over time, depending on their initial income levels, rather than indicating an overall trend in terms of convergence. The shape of the estimated equation when the quadratic model is used supports this finding. The interpretation that may be placed on the results from Figure 4.4 is that, in the 1980-2000 period, depending on the initial level of the income gap, provinces have exhibited different trends in terms of income growth convergence. It seems from the figure that for the provinces, which had initial income levels higher than the national average, the gap tended to decline. From the figure, it is once more seen that the provinces Kocaeli, İçel, İstanbul and İzmir stay at the right edge of the figure as a distinct group. On the other hand, some provinces (Ankara, Bursa, Denizli, Eskişehir, Manisa and Sakarya), which had greater but close to the average initial income levels tended towards convergence over time in terms of GDP per capita. However, for the others, which had lower than average initial income levels, the income growth differences increased over 1980-2000. These provinces, Ağrı, Bitlis, Erzincan, Erzurum and Muş being at the left corner of the figure as the other extreme, tended to diverge from the rest of the country and deteriorate in terms of their GDP per capita.

The results for the previously defined Club 1 and Club 2 indicate similar results. The model is significant at 5% level and the adjusted R^2 value increases

Table 4.4 Results of Absolute Beta Convergence with Quadratic Model

Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$						
	Model 1		**Model 2 (Club 1)**		**Model 3 (Club 2)**	
Independent variables	Coefficient (s.e)	Sig. t	Coefficient (s.e)	Sig. t	Coefficient (s.e)	Sig. t
Constant	0,004 (0,013)	0,087	0,011 (0,002)	0,0001	-0,015 (0,005)	0,0067
$\log Y_{it0} - \log^{-} Y_{t0}$	0,005 (0,013)	0,670	-0,025 (0,041)	0,021	-0,059 (0,052)	0,270
$(\log Y_{it0} - \log^{-} Y_{t0})^2$	-0,131 (0,036)	0,0005	-0,086 (0,041)	0,043	-0,202 (0,102)	0,059
R^2	0,282		0,246		0,325	
Adjusted R^2	0.258		0,199		0,274	
Standard error	0,016		0,011		0,012	
d.f.	2		2		2	
F	11,972		5,220		6,273	
Sig. F	0.000		0.01		0,006	

Figure 4.4 Scatterplot of Income Growth Rate Differences (1980-2000) and Initial Income Gaps (1980) for the Quadratic Model



from 12% to 20% and from 20% to 27%, respectively. When the figures are investigated, it is seen that rather than talking about a general income growth convergence trend for Club 1 and Club 2 as predicted by the linear model, for some provinces the gap decreases, while for others the reverse holds within the clubs.

Figure 4.5 shows the shape of the estimated equation for Club 1. It seems that income growth difference of most of the provinces previously defined as Club 1 declined over the period 1980-2000. These provinces are, on the one hand those that are the major metropolitan centers (İçel, İstanbul, İzmir and Kocaeli) and on the other hand those that are close to major metropolitan areas and located along the main transportation axes and gateways of export activity (Ankara, Bursa, Çanakkale, Denizli, Manisa, Sakarya, Tekirdağ). It seems that provinces whose initial income gap is less than –0,2 tended to converge in terms of per capita income growth. For provinces with further initial income gaps, on the other hand the gap tended to increase over 1980-2000. These include some provinces in the southeastern part of Turkey (Diyarbakır, Gaziantep, Kahramanmaraş and Malatya) and some provinces located in the northern and central part of the country (Amasya, Artvin, Çorum, Kastamonu, Ordu, Sivas), although they indicated higher than average income growth rates. The findings indicate that for some of those provinces, which were previously defined as dynamic growth regions, it is not possible to talk about convergence among the provinces of Club 1, although their income growth rates were higher than the national average.

For Club 2, however, Figure 4.6 indicates increasing income growth differences for a considerable number of provinces. It seems from the figure that, provinces whose initial income levels were less than the average exhibited a tendency to diverge from the others among the provinces of Club 2 and deteriorate in terms of per capita income. To conclude, regional income growth convergence over 1980-2000 indicated a complex trend in Turkey in that, depending on regional initial income levels, there are different tendencies towards convergence. Nevertheless, more important than this trend of regional

Figure 4.5 Scatterplot of Income Growth Rate Differences (1980-2000) and Initial Income Gaps (1980) for the Quadratic Model for Club 1

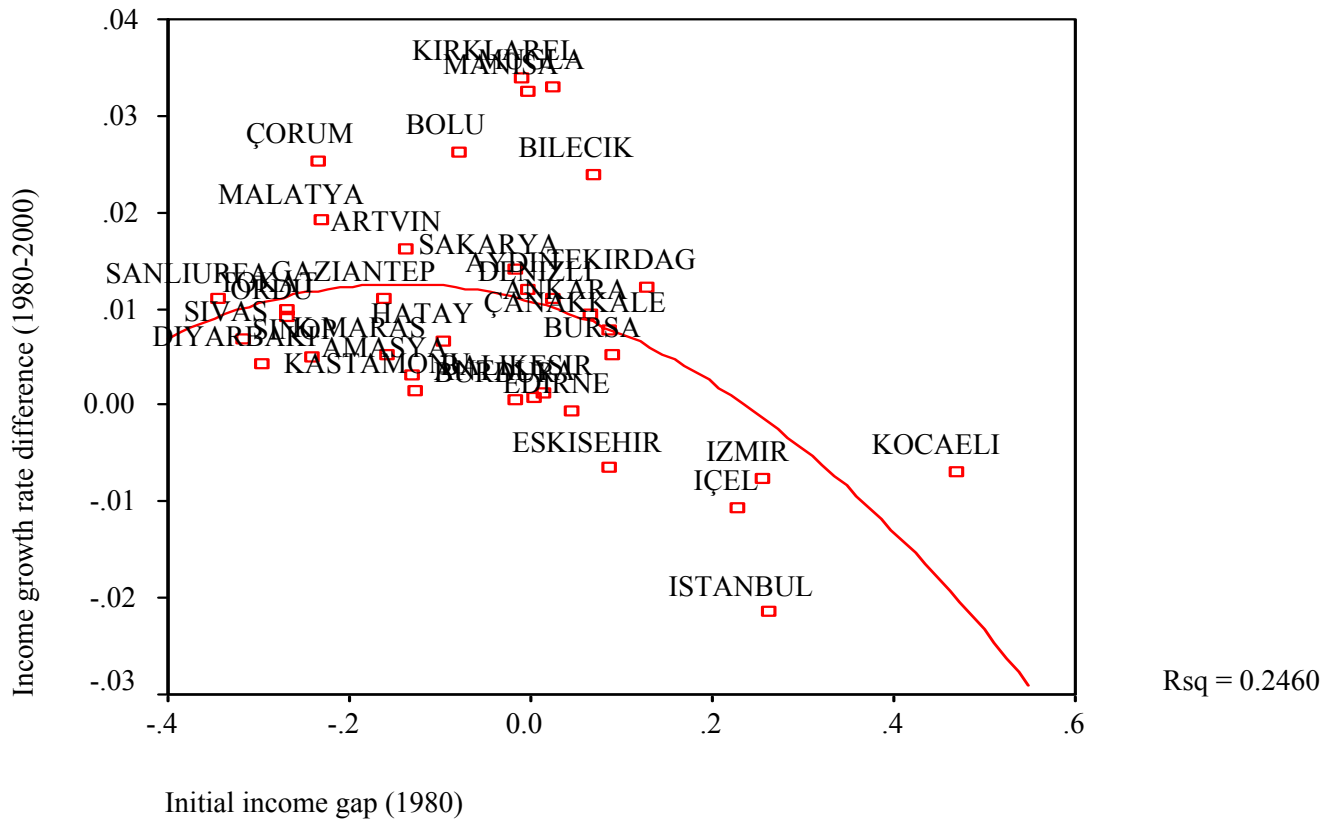
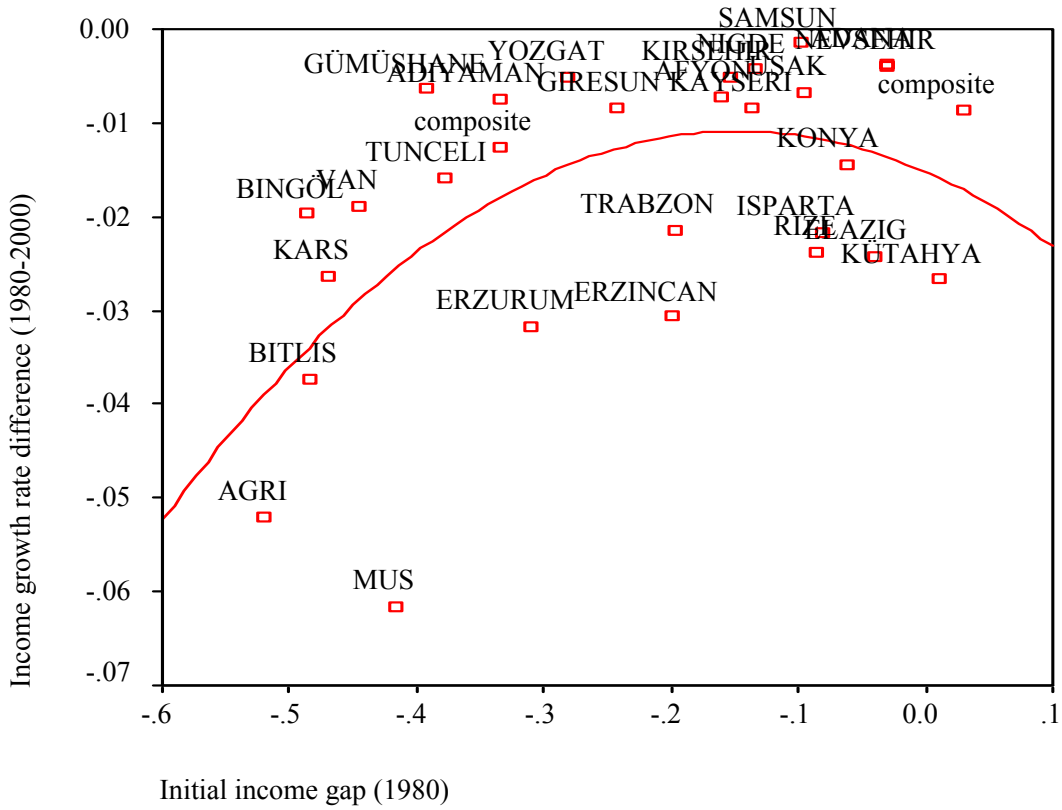


Figure 4.6 Scatterplot of Income Growth Rate Differences (1980-2000) and Initial Income Gaps (1980) for the Quadratic Model for Club 2



Rsq = 0.3255

convergence/divergence is to focus on the causes of this evolution of regional disparities, which can explain the different capacities and behaviors of different regions. The analysis of conditional beta convergence in the next part will aim to explore the causes of regional income growth disparities in Turkey between 1980 and 2000, by focusing on human capital differences of provinces.

4.1.2 Conditional Beta Convergence

Many studies referred to factors that can explain the trend in convergence/divergence patterns. Most of these studies highlighted human capital as a proxy for learning (Arrow, 1962), knowledge externalities (Romer, 1986), and innovation (Romer, 1990; Grossman and Helpman, 1991), which are believed to promote growth. In order to include the contribution of human capital differences in explaining per capita income differences of provinces, the previous equation is modified as follows:

$$\Delta Y_{it} - \bar{\Delta} Y_t = \beta_{0i} - \beta_1 * (\log Y_{it0} - \log \bar{Y}_{t0}) - \beta 2 * (\Delta HC_{it} - \bar{\Delta} HC_t) + v_{it},$$

Equation (7)

where HC refers to a vector of human capital variables; ΔHC_{it} is the growth rate of the variables in region i and $\bar{\Delta} HC_t$ corresponds to the national average growth rate of human capital variables.

Before providing a detailed analysis of income growth rate differentials among provinces in Turkey, when conditioned on human capital variables, it would be better to give a detailed account of how human capital is defined in this study and also to investigate spatial variations in Turkey in terms of three different components of human capital. An examination of the very basic indicators of schooling, innovation and entrepreneurship would provide a general picture of regional differences across the major components of human capital give an idea about to what extent they are consistent with regional income growth differences.

Indicators of human capital used in this analysis are determined based on a three-fold definition of human capital, in terms of educational attainment (Barro, 1997; Barro and Lee, 1993, 1996), with regard to learning and innovation (Romer, 1990; Verspagen, 1994), and pertaining to entrepreneurship (Malecki, 1997). As previously explained, literature on endogenous growth is full of empirical studies which proved the role of education or schooling on economic growth. On the other hand, it is apparent that education or schooling is no longer adequate for the growth of economies in today's post-industrial world (Keane and Allison, 2000). Obviously, education obtained through formal schooling needs to be complemented by other capacities. Capacities to learn and innovate as well as entrepreneurial capacities are important to contribute to the development of human capital attained by formal education. Therefore, in addition to schooling, learning, innovation and entrepreneurial capacities are important components that define human capital. A summary of the variables used in the analysis is given in Table 4.5.

Table 4.5 Summary of the Variables Used

Indicator	Year
Education	
Combined school enrollment ratio	1975-1992
Student-teacher ratio	1992-2000
Number of university graduates per 10 000 population	1992-2000
Number of graduates of Ms and PhD per 10 000 population	1992-2000
Innovation and Learning	
Patent dummy	2001
Number of academic personnel per 10 000 population	1992-2000
Entrepreneurship	
Rate of open-up firms	1991-2000
Rate of open-up joint-stock companies in open-up firms	1991-2000
Rate of exporting firms in total firms	1989-2001
Rate of foreign firms in total firms	1980-2003

As for the first definition, the concept of human capital embodies *education*. Four variables are determined to estimate the relation between regional growth differentials and regional differences in human capital, when human capital is defined in terms of education. The first variable, combined school enrollment ratio, is the number of students enrolled in primary and secondary schooling as

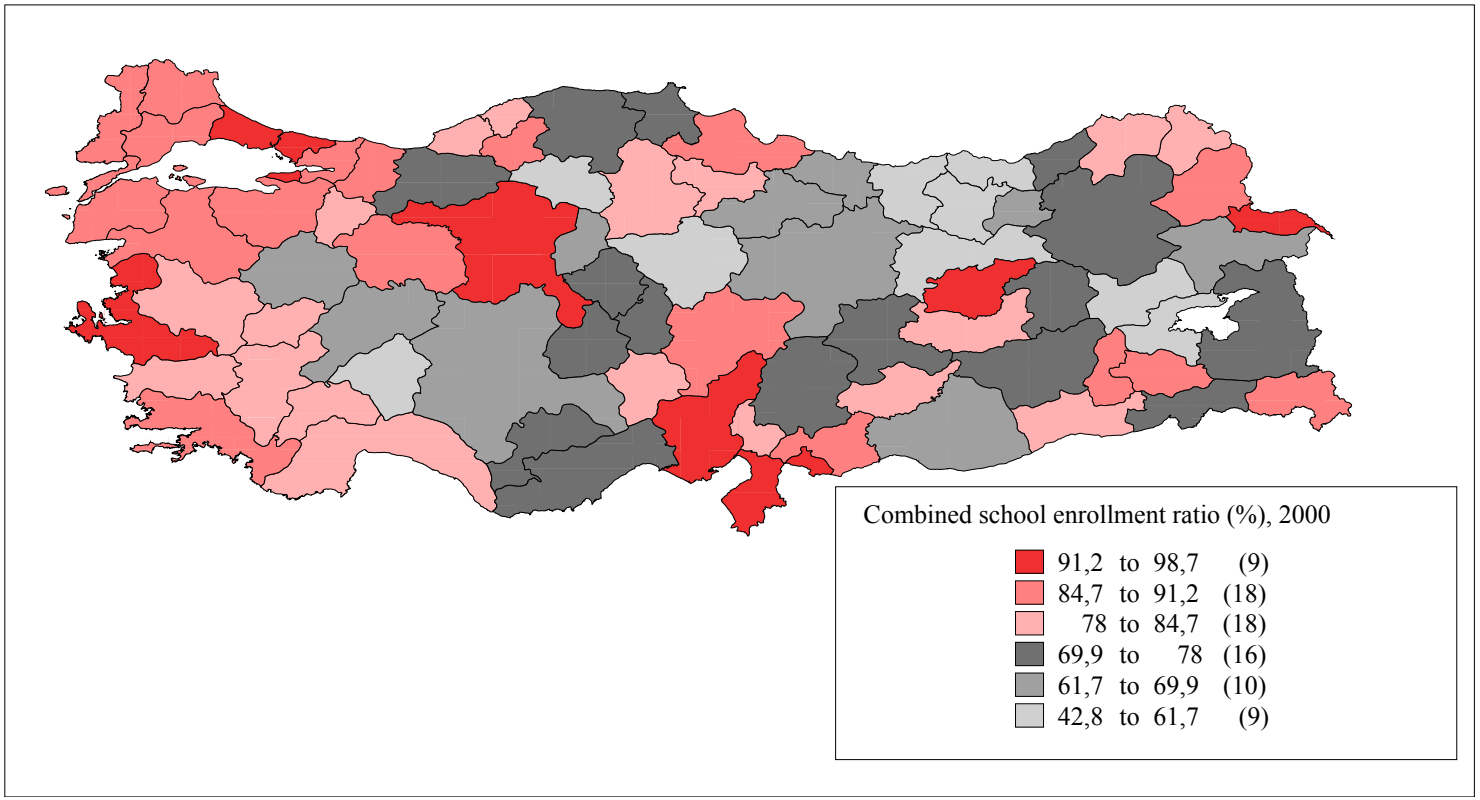
a percentage of the population between ages 6 to 19. School enrollment ratios are used in most of the studies to measure the accumulation of these flows. It reflects flows of education, the accumulation of which creates future stocks of human capital (Barro and Lee, 1993). Because of the long time lag between these flows and stocks, this variable is used with 10 years time lag.

Map 4.3 provides a picture of the distribution of combined enrollment ratios in Turkey and gives an idea about spatial differences in terms of basic schooling. The map shows that there are substantial variations between the east and the west part of Turkey. It is apparent from the picture that basic schooling shows a tendency to be highest in the western part and lowest in the eastern. The three most prosperous provinces of the country are seen to have superior combined enrollment ratios, followed by the ones at their first and second periphery. Nevertheless, it appears that there are differences between these provinces in terms of their combined enrollment rates. Although there are provinces in the western part, whose basic schooling is inferior to the national average (81%), it seems that in the eastern part there are quite a big number of provinces that are in a disadvantaged position when compared to the national average. Consequently, regional differences in basic schooling may help us explain per capita income growth differences among provinces in Turkey.

Another indicator in terms of schooling, most widely used in studies is the quality of basic schooling. Teacher-student ratios are used to measure differences in the quality of schooling across countries or regions (Barro, 1991; Barro and Lee, 1996). This is defined here as the number of teachers per student in primary and secondary schooling. Higher teacher-student ratio indicates a high quality of schooling and thus higher human capital.

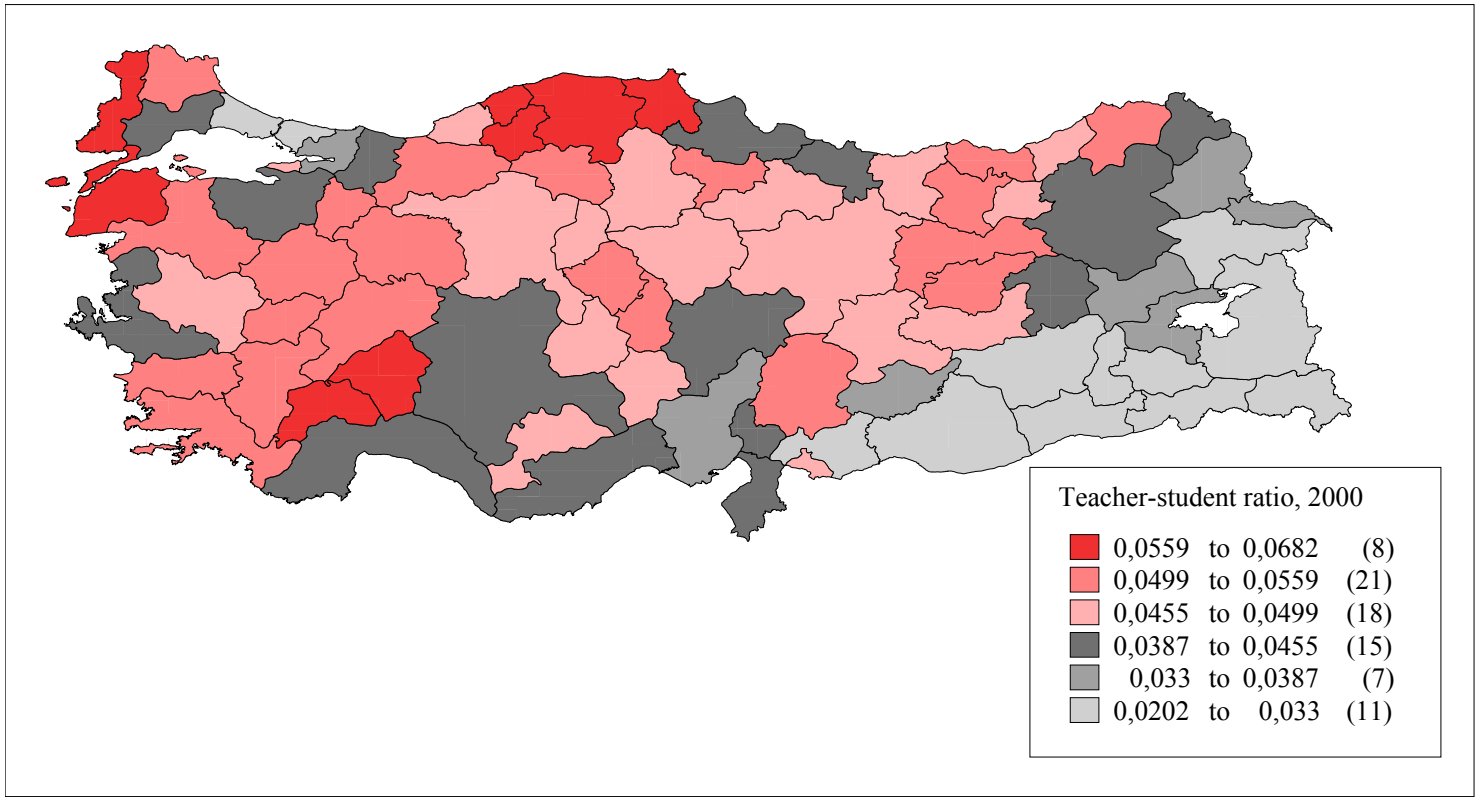
It appears from Map 4.4 that the quality of schooling indicated by the number of teachers per student in the metropolitan centers of Turkey is similar to that of the least developed provinces of the country located in the east. This is obviously the result of high population in the former, especially as a result of migratory movements.

Map 4.3 Spatial Distribution of Combined School Enrollment Ratio in Turkey (%), 2000



Source: Calculated based on various data from SPO (2002)

Map 4.4 Spatial Distribution of Teacher-Student Ratio in Turkey, 2000



Source: Calculated based on various data from SIS (2002)

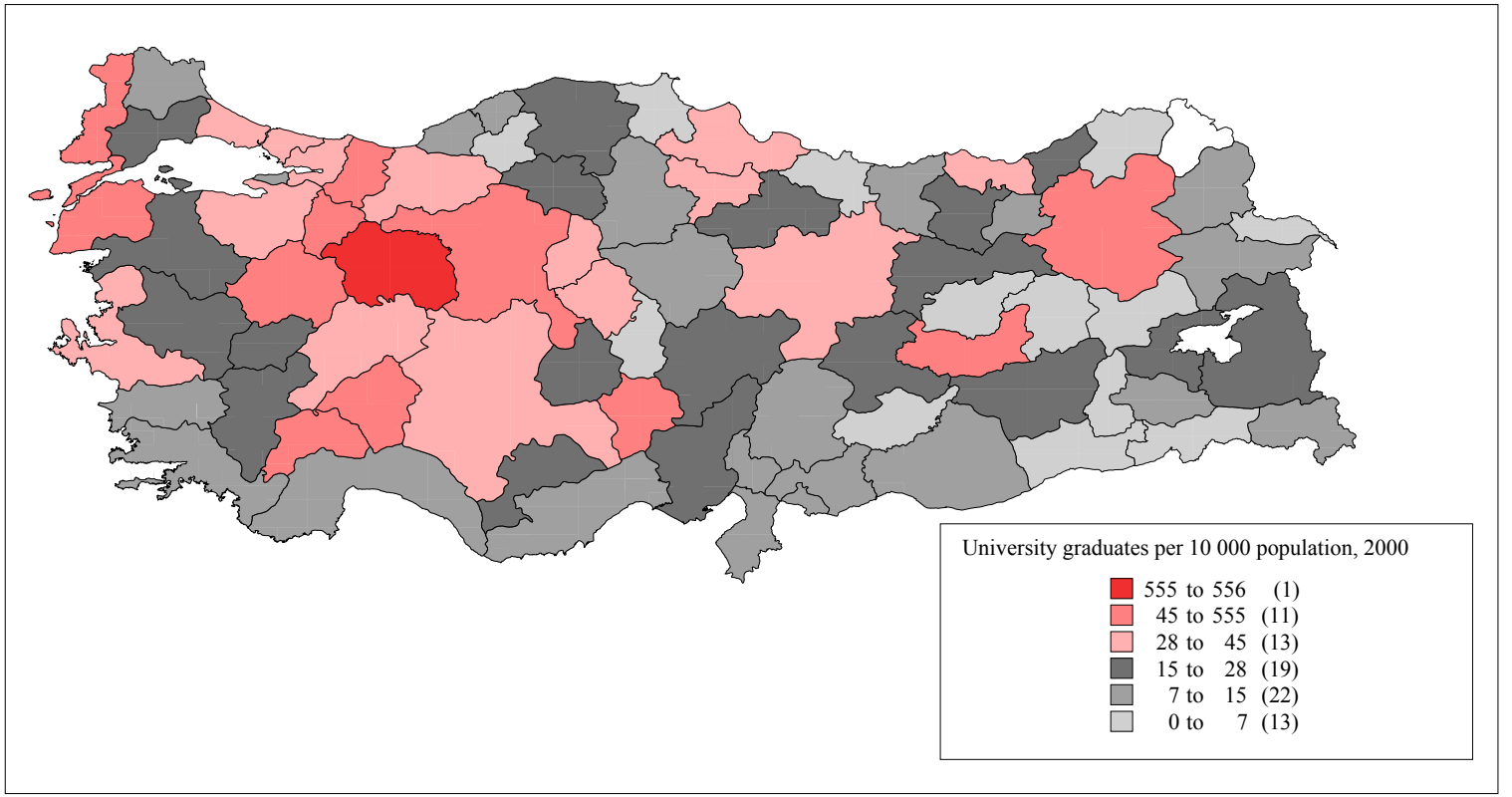
On the other hand, in most of the studies, adult literacy rates are used to measure the initial and current stocks of human capital for adult population. However, literacy is the initial stage in the development of human capital. For this reason, instead of this measure, the number of university graduates per 10 000 population are included in this analysis in order to measure the stock of human capital.

Besides university graduates, number of graduates at master's and doctorate levels are included in the analysis to measure stocks in a higher stage of the path of human capital formation. As concepts of learning and innovation become more important as ways of responding to the rapidly changing conditions of today's economic environment, it is assumed that the highest levels of education will provide the necessary sources of knowledge and capacities of learning. University as well as higher levels of schooling graduates are assumed to embody capacities of academic research and expected to facilitate the diffusion of knowledge and technology.

The actual variation between provinces in their stock of high-educated population can be illustrated from Map 4.5. The picture indicates considerable differences in university graduates per 10 000 population between the western and eastern parts of the country. Most of the provinces in the former have university graduates per 10 000 population higher than the national average (31), whereas most of the provinces in the eastern part are in an inferior position in this respect.

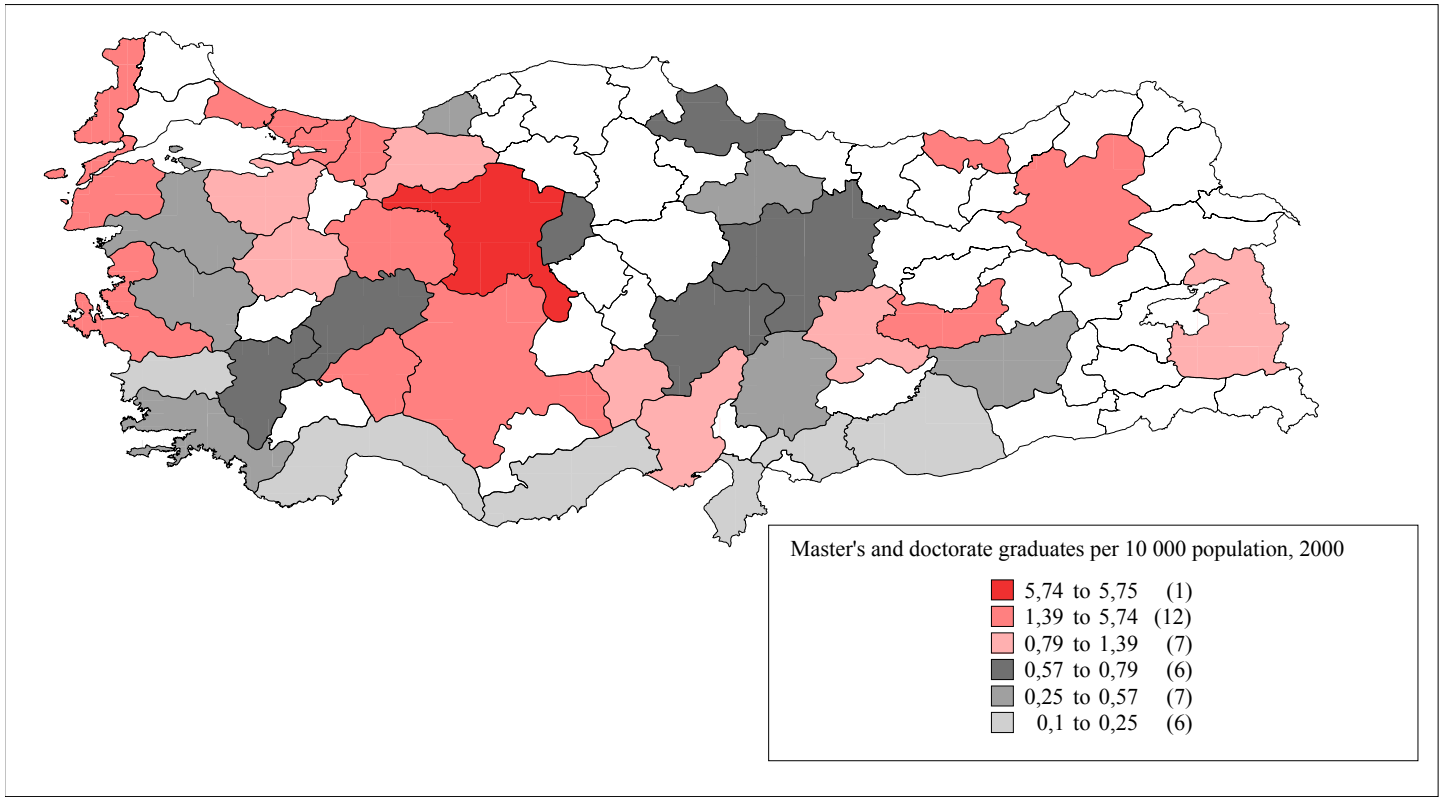
Map 4.6 shows a more nodal distribution of the number of graduates at the master's and doctorate level per 10 000 population. It seems that master's and doctorate graduates are the highest in the metropolitan centers and than at their near periphery. On the other hand, some of the centers, which have universities appeared to have lower number of graduates per 10 000 population, while some provinces in the east seem to have a considerable number of master's and doctorate level graduates. This unexpected pattern can, again, be explained by the distribution of population among these provinces, where apart from the

Map 4.5 Spatial Distribution of the Number of University Graduates per 10 000 Population in Turkey, 2000



Source: Calculated based on various data from SIS (2002)

Map 4.6 Spatial Distribution of the Number of Master's and Doctorate Level Graduates per 10 000 Population in Turkey, 2000



Source: Calculated based on various data from SIS (2002)

natural increase, population increases substantially in the former by migratory movements.

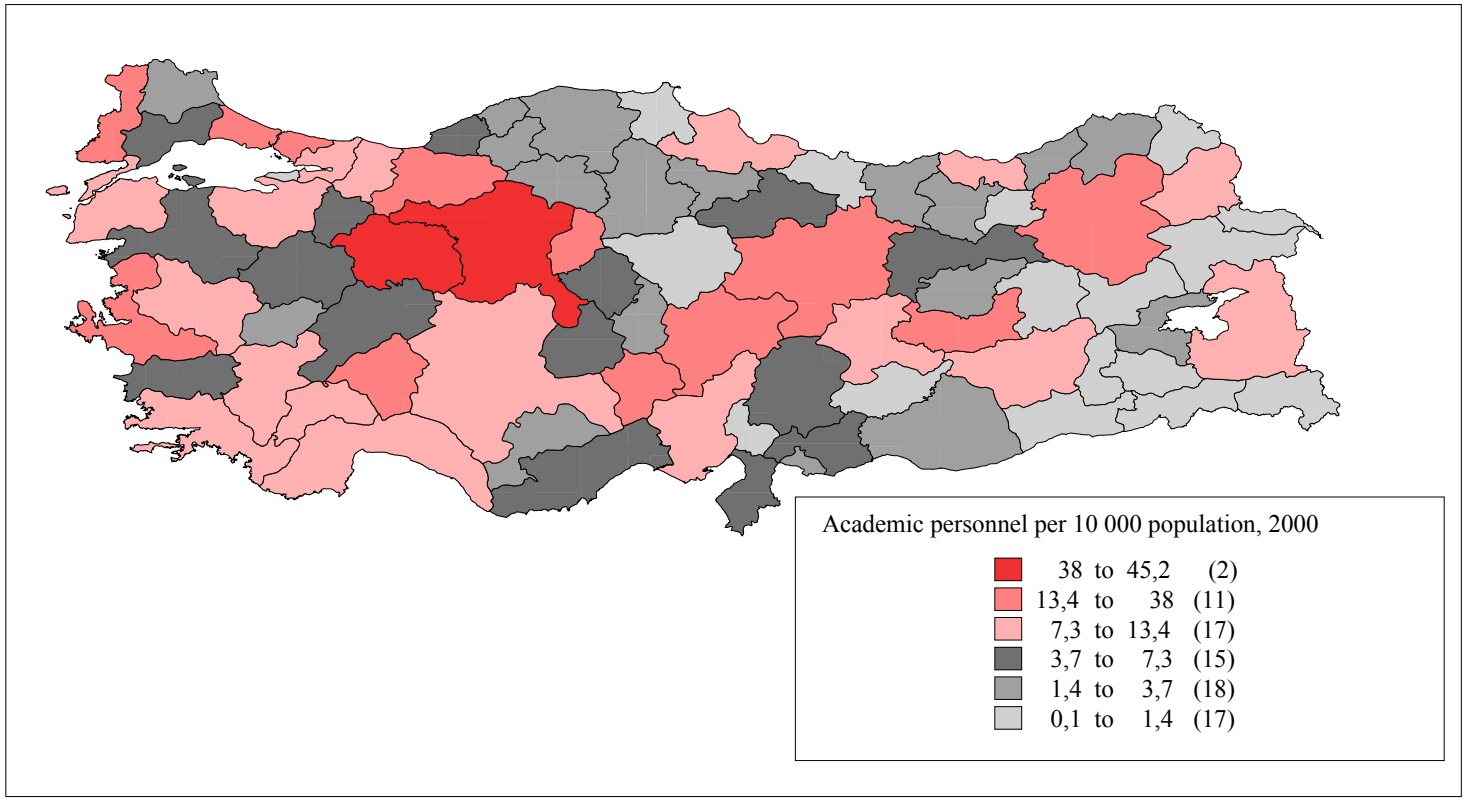
Concerning the definition of human capital with regard to learning and innovation, three variables are determined. Most widely used technology indicators in studies on innovation are R&D and patenting. These two indicators are assigned different roles. R&D measures are related with both innovation and imitation, while patenting measures are associated directly with new knowledge creation (Verspagen, 2000).

Having this differentiation in mind, two proxies for human capital related with innovation are the share of R&D personnel in total employment and the number of academic personnel per 10 000 population. Regions with higher rates of employment in R&D and higher numbers of academic personnel are expected to have a higher capacities to innovate and thus higher per capita income growth performances. Unfortunately, the former, R&D employment, as an indicator of human capital that contributes to innovation and imitation is not available at the provincial level. Therefore, the number of patents per 10 000 population is used as the indicator related with innovation. It is assumed that regions with higher number of patents per population have higher human capital capacities that generate new knowledge.

Map 4.7 and 4.8 depicts the spatial variation in academic personnel and patents per 10 000 population. It seems that human capital related with innovation and imitation show a distinct tendency to be highest in the western part of the country and lowest in the eastern part, except a few provinces, which have universities. The distribution of patents per 10 000 population, indicating the generation of new knowledge, on the other hand, is extremely concentrated in a few provinces of the country[5]. These provinces are where most of the manufacturing and export activity is concentrated. It seems that there are only a few provinces, which have human capital capacities that generate new

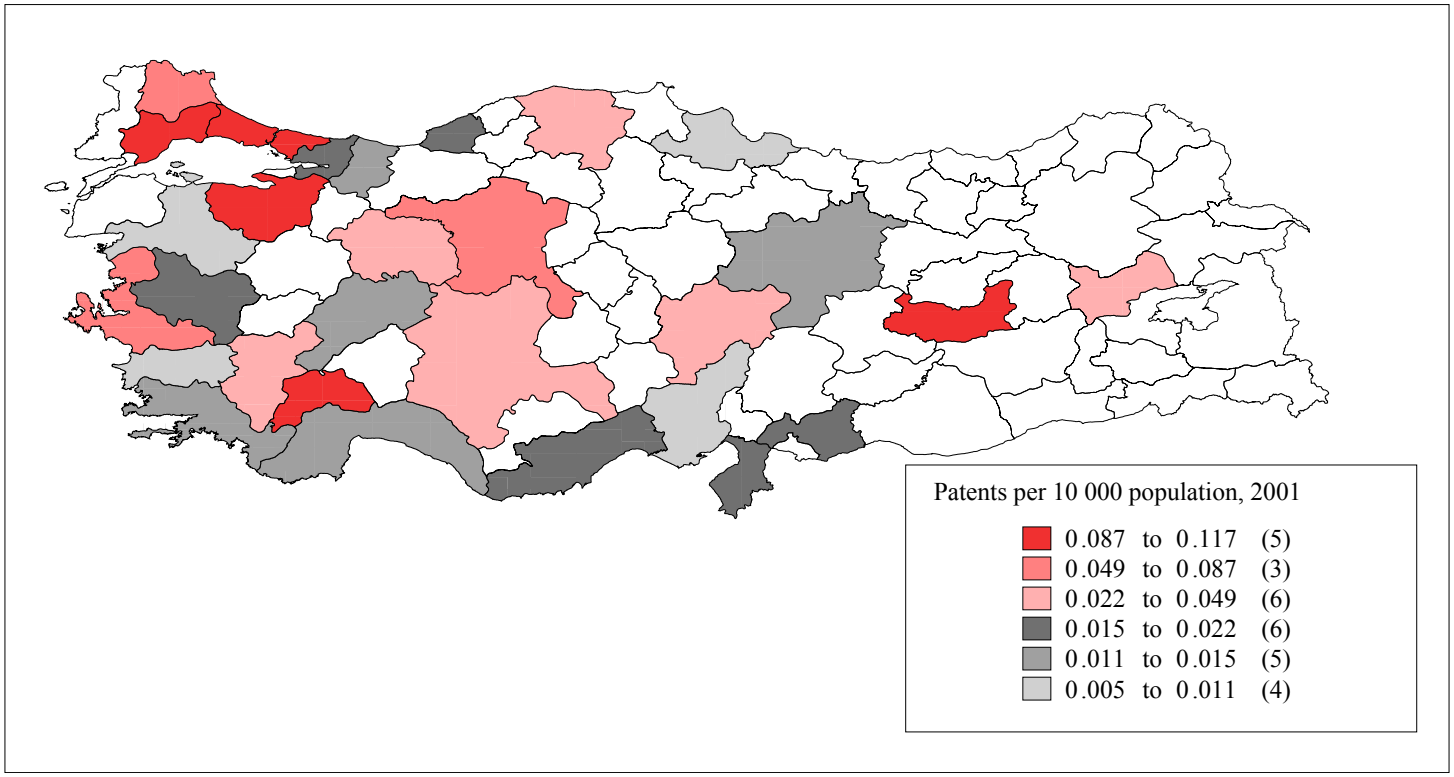
[5] Because of that this variable is included in the analysis of beta convergence as a dummy variable.

Map 4.7 Spatial Distribution of the Number of Academic Personnel per 10 000 Population in Turkey, 2000



Source: Calculated based on the data from SIS (2002)

Map 4.8 Spatial Distribution of the Number of Patents per 10 000 Population in Turkey, 2001



Source: Calculated based on the unpublished data from Turkish Patent Institute (2001)

knowledge. Apparently, there are substantial differences among provinces in Turkey regarding the human capital related with innovation and imitation.

Besides schooling and innovation, entrepreneurship is referred to as one of the prominent of economic development since 'entrepreneurs respond to market opportunities left unfilled by large enterprises' (Malecki, 1997). It is strongly mentioned as one of the major characteristic of the post-industrialized economy. Many studies taking as references different countries and regions documented that entrepreneurship is of significant importance in shaping thefuture growth of a region (Malecki, 1997; Mawson, 1991). On the other hand, these studies emphasize human capital as one of the factors influencing regional variations in entrepreneurship (Armington and Zoltan, 2002; Fotopoulos and Spence, 1999; Georgellis and Wall, 2000). This is because, it is argued, more educated people have more capacities to use in an enterprise (Malecki, 1997) and regional human capital is important.

Entrepreneurship is usually defined as new firm formation and measured by self-employment, employment in newly opened firms, or firm birth rates[6]. Mawson (1991: 73) highlights that 'New firms are frequently considered to be more flexible, dynamic and innovative than larger established firms. They are said to be more responsive to shifts in demand, prices and technology, and quicker to adapt to changing economic conditions[7].

In the case of entrepreneurship, human capital performance of a region is defined as its capacity of new firm formation. New firm formation is assumed to give an idea about the human capital performance of regions. A relatively high regional rate of new firms indicates higher human capital performance of regions. The proxy for used in this study is the rate of newly opened firms in total firms. This includes five types of companies defined by SIS, namely joint

[6] Firm birth rate is defined as the rate at which new firms are being established' (Armington and Zoltan, 2002: 34

[7] The analysis could not be preceded for the period 1980-2000 since data for most of the variables was not available for the year 1980. Hence, analyzing the role of human capital differences on income growth disparities would be more reasonable for the 1989-1999 period, when income growth disparities indicated a general tendency to decline until the year 2000.

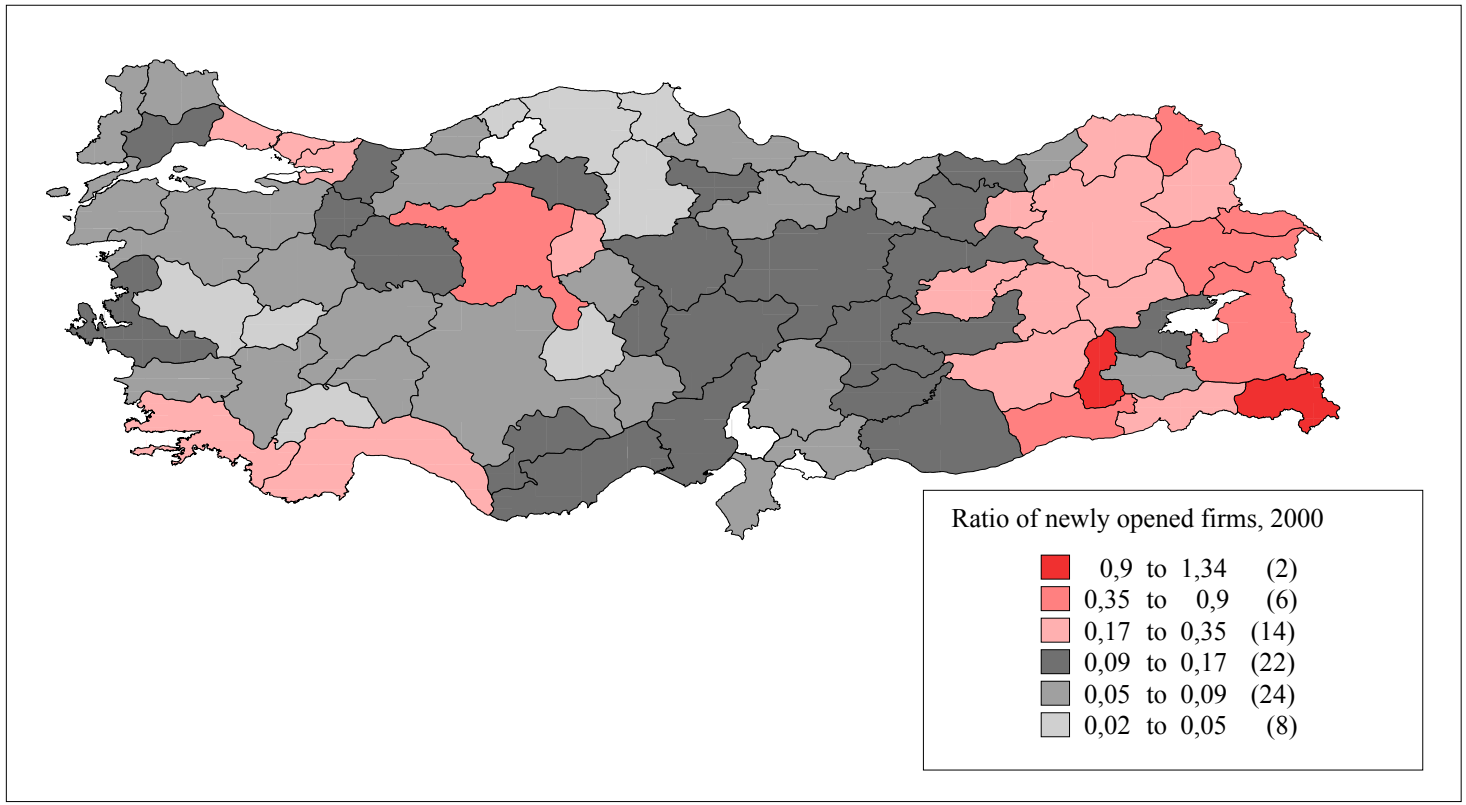
stock companies, general partnerships, limited partnerships, limited liability companies and cooperatives. Besides this, the rate of new joint stock companies in new firms is used as an indicator of regional collective relations in entrepreneurial activities, which is underlined as an important human capital capacity in associational economies.

The other indicators defined under entrepreneurship are the rate of firms with foreign capital and the rate of exporting firms. These measures are used to reflect the external relationships, which facilitate the diffusion of external knowledge. Accessibility to and ability to use external knowledge are emphasized to ease the transfer of knowledge and stimulate the growth of regions. Regions with higher ratios of exporting firms and firms with foreign capital are assumed to have capacities to connect to the external world, therefore higher human capital capacities.

Map 4.9 and Map 4.10 give an idea about the entrepreneurial capacities of provinces. The picture indicates that there are major differences between provinces in terms of new firm formation. However, it appears from Map 4.11 that only some of the provinces, which have high firm open-ups, have the capacity to connect to the external world, reflected by the ratio of exporting firms. Yet, a substantial amount of provinces, most of which are located in the eastern part of the country, do not have the exporting capacity. Furthermore, Map 4.12 shows that a more differentiated pattern exists in terms of the ratio of firms with foreign capital, which would ease the transfer of knowledge from outside. Of the provinces, which have high ratios of exporting firms, only some have high ratios of firms with foreign capital. On the other hand, provinces with relatively lower ratios of exporting firms appear to have high ratios of firms with foreign capital, while most of the provinces in the eastern part of Turkey are short of firms with foreign capital. Data for these ten variables is prepared for the period 1990-1999[8] for 65 provinces, which includes two

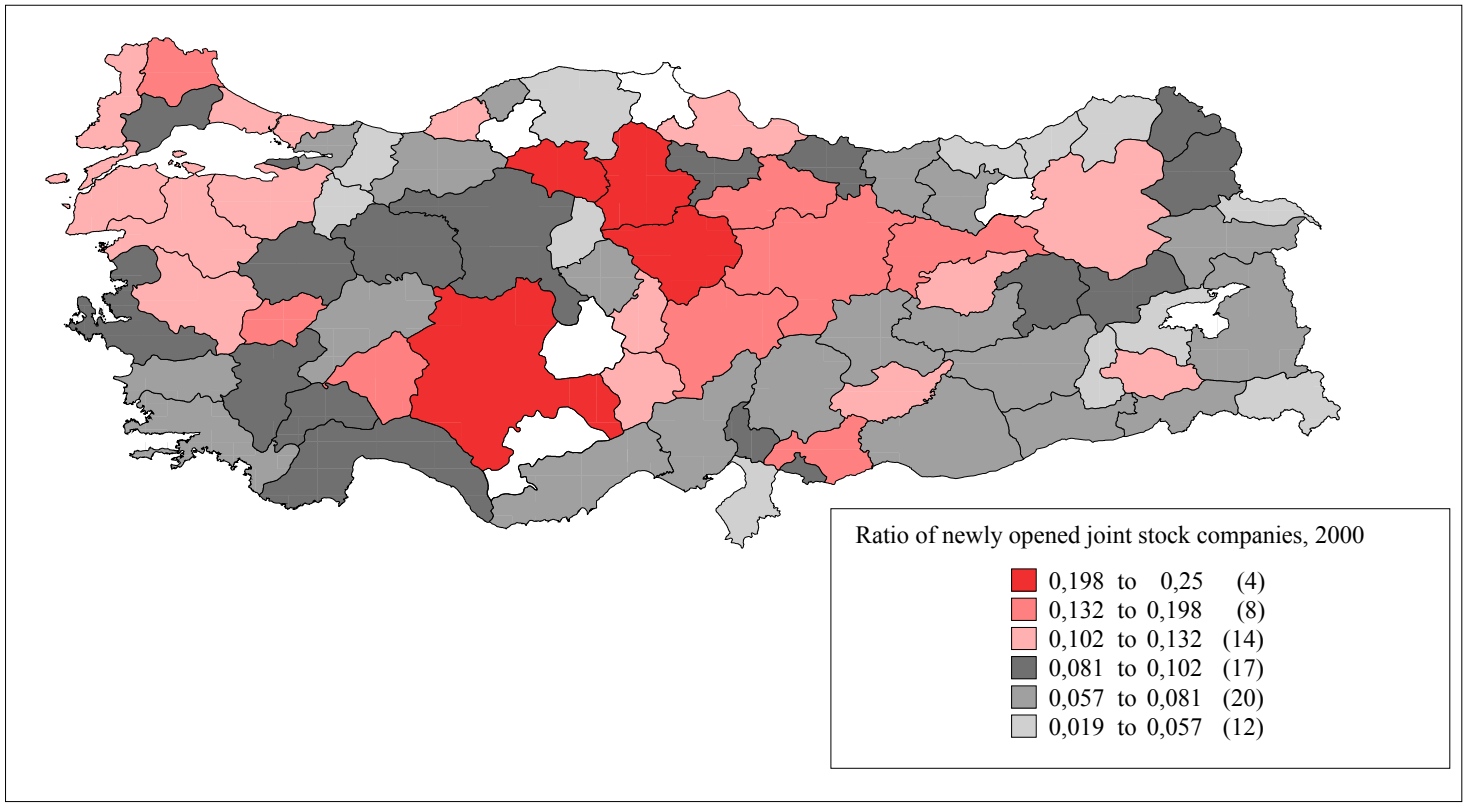
[8] The analysis could not be preceded for the period 1980-2000 since data for most of the variables was not available for the year 1980. Hence, analyzing the role of human capital differences on income growth disparities would be more reasonable for the 1989-1999 period, when income growth disparities indicated a general tendency to decline until the year 2000.

Map 4.9 Spatial Distribution of the Ratio of Newly Opened Firms in Turkey, 2000



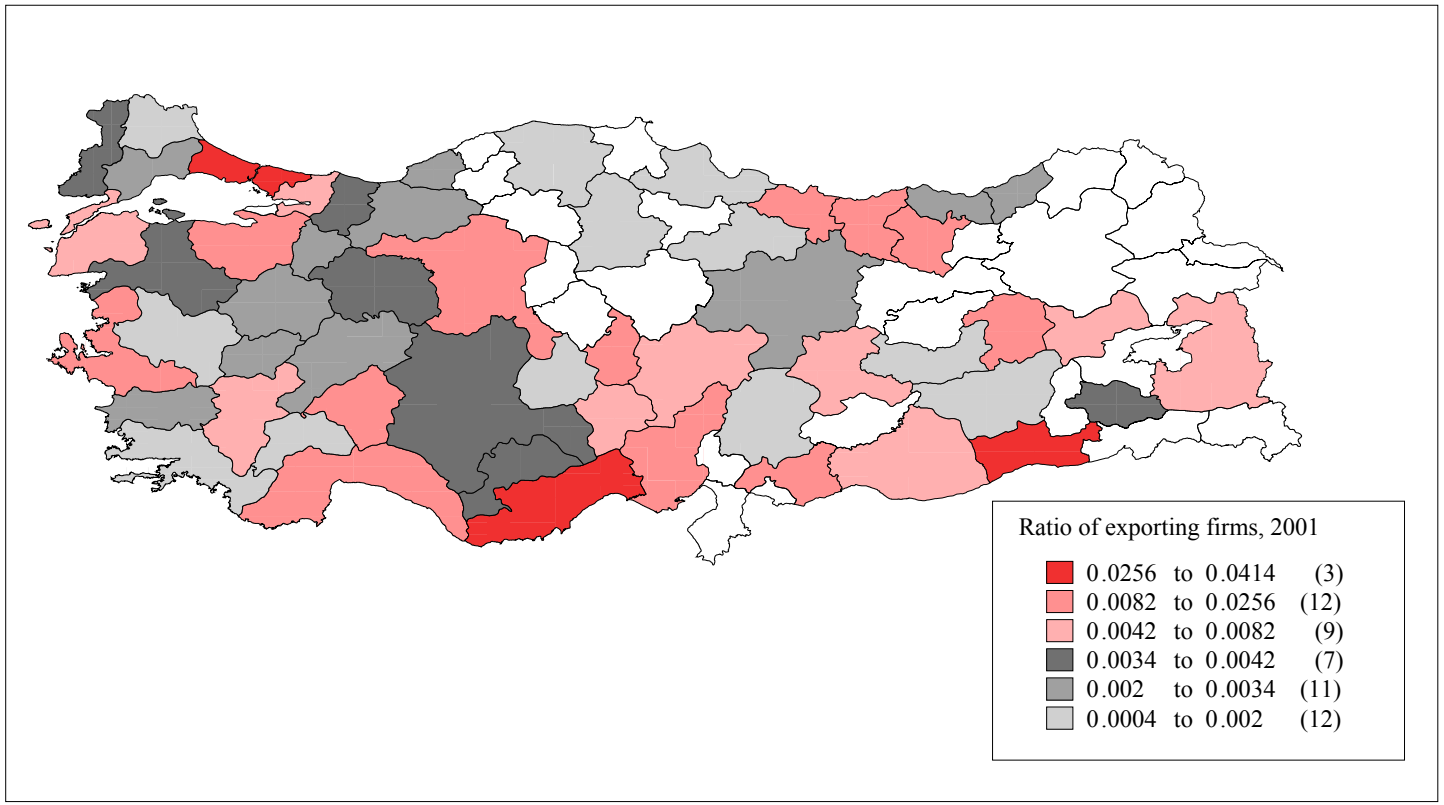
Source: Calculated based on the data from SIS (2000)

Map 4.10 Spatial Distribution of the Ratio of Newly Opened Joint-Stock Companies in Turkey, 2000



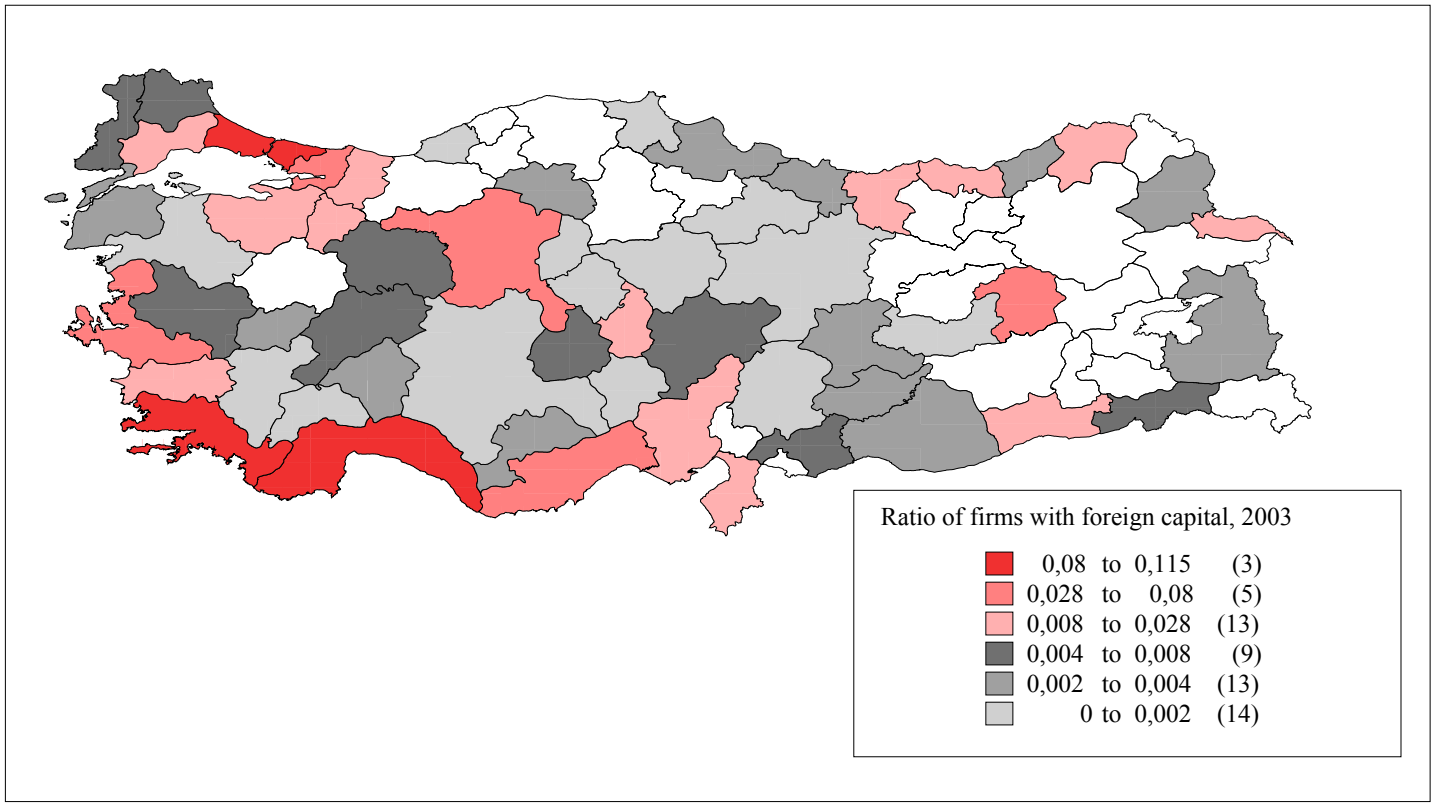
Source: Calculated based on the data from SIS (2000)

Map 4.11 Spatial Distribution of the Ratio of Exporting Firms in Turkey, 2001



Source: Calculated based on the unpublished data from Undersecretariat of Foreign Trade, 2003

Map 4.12 Spatial Distribution of the Ratio of Firms with Foreign Capital in Turkey, 2003



Source: Calculated based on the unpublished data from Undersecretary of Treasury, 2003

composite provinces[9]. In order to eliminate the problems of normality and homoscedasticity, variables are used at log levels. The analysis is preceded with 3 models. The first model takes into consideration only the traditional indicators of human capital, while the second and third models include new components of human capital in the analysis of beta convergence. The former takes in innovation variables as well as schooling, while the latter further includes variables of entrepreneurship.

Table 4.6 gives the results of the initial regression analysis. The VIF values indicate that there is no problem with multicollinearity, given that the values are lower than the critical value of 5 (De Vaus, 2002: 345). It is seen that all models are significant at 5% level. On the other hand, when the adjusted R^2 values are evaluated, it is seen that human capital differences explain a considerable share of the variation in regional income growth differentials in the first model (42%). The findings point out that human capital differences in terms of education determine the per capita income growth differences among the provinces of Turkey.

On the other hand, once innovation and learning component of human capital is taken into consideration in the second model, the adjusted R^2 value indicates that addition of innovation variables did not contribute to explaining the variation in regional income growth differences. Yet, the adjusted R^2 value declines to 35% and the variables are not significant at 5% significance level. Neither capacities of new knowledge creation, represented by the patent dummy nor academic capacities that contribute to the generation of new knowledge do help us explain regional income growth disparities. However, with the inclusion of indicators of entrepreneurship in the third model, the model explained 40% of the variation in income growth rate differences among provinces. Still, at 5% significance level, education is a significant factor in explaining income growth disparities, while innovation and learning component

[9] For an explanation of how a composite city is defined, see Chapter 2.

Table 4.6 Results of Conditional Beta Convergence Analysis

Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$	**Model 1**			**Model 2**			**Model 3**			**Model 4**		
Independent variables	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. T	VIF	Coefficient (s.e)	Sig. T	VIF
Constant	0.019 (0.025)	0.449		0.025 (0.030)	0.399		0.046 (0.030)	0.131		0.036 (0.021)	0.087	
$\log Y_{it0} - \log^{-} Y_{t0}$	-0.168 (0.012670)	0.001	1.103	-0.161 (0.052)	0.003	1.271	-0.140 (0.058)	0.019	1.701	-0.150 (-0.331)	0.003	1.190
GAP_combined enrollment ratio	-0.241 (0.052)	0.000	1.123	-0.242 (0.053)	0.000	1.139	-0.221 (0.053)	0.000	1.243	-0.251 (0.052)	0.000	1.132
GAP_teacher-student ratio	-0.026 (0.011)	0.024	1.086	-0.026 (0.012)	0.033	1.112	-0.024 (0.011)	0.041	1.161	-0.03 (0.011)	0.018	1.100
GAP_university graduates	-0.000 (0.000)	0.008	1.105	-0.001 (0.000)	0.008	1.125	-0.001 (0.000)	0.001	1.458	-0.001 (0.000)	0.001	1.191
GAP_doctorate level gaduates	-0.000 (0.000)	0.097	1.035	-0.000 (0.000)	0.130	1.090	-0.000 (0.000)	0.078	1.225	-		
GAP_academic personnel	-			-0.000 (0.000)	0.836	1.104	-0.000 (0.000)	0.791	1.176	-		
Patents	-			-0.009 (0.024)	0.700	1.284	-0.033 (0.029)	0.250	1.908	-		

Table 4.6 Initial Results of Conditional Beta Convergence Analysis (continued)

Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$	**Model 1**			**Model 2**			**Model 3**			Model 4		
Independent variables	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. T	VIF	Coefficient	Sig. T	VIF
GAP_open-up firms	-			-			0.023 (0.015)	0.130	1.563	-		
GAP_open-up join stock companies	-			-			0.262 (0.120)	0.033	1.523	0.197 (0.107)	0.070	1.169
GAP_exporting firms	-			-			-0.016 (0.009)	0.071	2.603	-		
GAP_firms with foreign Capital	-			-			0.013 (0.022)	0.595	2.027	-		
R^2	0.426			0.427			0.508			0.431		
Adjusted R^2	0.376			0.356			0.404			0.382		
Standard error	0.084			0.085			0.0824			0.083		
d.f.	5			7			11			5		
F	8.601			5.973			4.884			8.786		
Sig. F	0.000			0.000			0.000			0.000		

of human capital does not have a significant role in explaining income growth differences among provinces in Turkey. The other variables, which explain regional income growth differences, are factors of entrepreneurship. Among these, differences in the rate of joint stock company open-ups have significant relationship with income growth differences; while regional differences in the rate of newly opened firms, the rate of exporting firms and the rate of firms with foreign capital appear to be insignificant. The significance levels indicate that only the addition of the rate of newly opened joint stock companies as a variable contributed to explaining income growth differences among the provinces in the period 1980-2000.

Model 4 is applied by excluding the insignificant variables from the regression analysis. The model explains the variation in the dependent variable better than the second and third models but worse than the first model. Yet, the rate of open-up joint stock companies is not significant at 5% level this time. It seems that all education variables, except for the number of doctorate level graduates, have statistically significant relationships with income convergence in Turkey, whereas innovative and entrepreneurial capacities included as other components of human capital do not contribute us to explain income growth differences among the provinces in Turkey between 1980 and 2000. On the other hand, it seems that variables of new knowledge creation and academic capacities as indicators of innovative and learning component of human capital do not help us explain regional income disparities among provinces significantly. This result appears to contradict with the results usually emphasized in the literature on regional growth. The argument is that academic capacities facilitate both the diffusion of knowledge and creation of new knowledge, which together stimulate the growth performances of regions.

For an attempt to explain the income growth differences in the two distinct clubs of provinces with human capital differences, conditional beta convergence analysis is reprocessed separately for the two groups. Table 4.7 presents the results. The beta convergence model for Club 1 did not give significant results at 5% level. It seems that human capital differences do not

Table 4.7 Results of Conditional Beta Convergence Analysis for Club 1 and Club 2

Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$	**Club 1**			**Club 2 Model 1**			**Club 2 Model 2**		
Independent variables	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. T	VIF
Constant	0.088 (0.035)	0.018		0.019 (0.058)	0.399	0.747	-0.04 (0.029)	0.205	
$logY_{it0}$- $log^{-} Y_{t0}$	-0.205 (0.0106)	0.064	1.576	-0.243 (0.122)	0.063	2.770	-0.290 (0.088)	0.003	1.408
GAP_combined enrollment ratio	-0.171 (0.115)	0.149	1.728	-0.271 (0.083)	0.005	2.218	-0.318 (0.069)	0.000	1.456
GAP_teacher-student ratio	-0.019 (0.015)	0.203	1.255	-0.053 (0.033)	0.130	1.834	-		
GAP_university graduates	-0.001 (0.001)	0.320	1.453	-0.001 (0.000)	0.003	2.257	-0.000 (0.000)	0.004	1.053
GAP_doctorate level Graduates	-0.000 (0.000)	0.097	1.277	-0.000 (0.000)	0.628	1.798	-		
GAP_academic personnel	-0.000 (0.000)	0.961	1.354	-0.000 (0.000)	0.634	1.943	-		
Patents	0.049 (0.051)	0.344	2.790	-0.011 (0.047)	0.816	2.398	-0.033 (0.029)		

Table 4.7 Results of Conditional Beta Convergence Analysis for Club 1 and Club 2 (continued)

Dependent variable: $\Delta Y_{it} - \Delta^{-} Y_t$	**Club 1**			**Club 2 Model 1**			**Club2 Model 2**		
Independent variables	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. t	VIF	Coefficient (s.e)	Sig. t	VIF
GAP_open-up firms	0.020 (0.022)	0.360	1.338	0.025 (0.026)	0.357	2.515	-		
GAP_open-up join stock companies	0.160 (0.194)	0.419	1.703	0.421 (0.215)	0.068	2.735	-		
GAP_exporting firms	-0.017 (0.014)	0.225	3.133	-0.011 (0.013)	0.429	2.504	-		
GAP_firms with foreign Capital	0.022 (0.037)	0.545	2.834	0.026 (0.039)	0.515	2.027	-		
R^2	0.487			0.427			0.545		
Adjusted R^2	0.239			0.505			0.488		
Standard error	0.059			0.076			0.078		
d.f.	11			11			3		
F	2.001			3.507			9.586		
Sig. F	0.075			0.012			0.000		

contribute to explaining the income growth differences among the provinces of this group. It is only the initial income differences, which explains income growth differences among provinces.

However, the reverse holds for Club 2. Human capital differences appear to explain a considerable share of the variation in income growth differences (50%). The model is significant at 5% level. This finding implies that income growth differences among the backward provinces can be attributed to human capital differences. Among the ten variables of human capital, combined school enrollment ratio and the number of university graduates per 10 000 population have statistically significant relationships with income growth differences. This implies that income growth differences across the lagging regions is to a substantial extent due to differences in schooling. The second model for Club 1 excludes the insignificant variables from the analysis. The results indicate that, in this case, the ability of the model to explain the variation in income growth differences declines 50% to 49%, although the decline is not substantial.

Overall, the results indicate that human capital differences, in terms of education or schooling, account for a substantial part of the income growth differences between the provinces in Turkey. Regions, which have substantial human capital differences are those, which have had the greatest income growth differences. Schooling capacity explains the income growth differences between the advanced and the backward areas (between Club 1 and Club 2) and income growth differences among the provinces of the backward regions, the persisting income growth differences across the provinces of the latter can to a large extent be attributed to differences in flows of basic schooling and stocks of university level human capital. This is finding is not surprising when the results of the empirical studies are considered. However, what is surprising is that variables included in our model as indicators of innovation and learning component of human capital as well as entrepreneurial capacities did not contribute to our explanation of income growth differences. As opposed to the usual argument in the literature about the importance of innovation and entrepreneurship, these variables did not appear to be significantly related with

regional income growth convergence in Turkey. The results become more surprising when the successful growth regions are analyzed separately as a group[10]. In this case, even the schooling variables did not appear to be significantly related with income growth rates. These results, obviously point to important questions in terms of theoretical arguments and in terms of the data used in such analysis, which will be discussed in the concluding chapter.

Nevertheless, the differential convergence pattern persisting since the 1980s, briefly sketched above signals the importance of increasing basic schooling capacities, although a very simple endeavor, on reducing income growth differences and eliminating the differential income growth pattern among provinces in Turkey. The results of the analysis provide a basis for arguing the urgent need for regional and national policies directed to increase the educational capacities of especially the lagging regions so as to decrease income growth differences among the provinces in Turkey.

[10] Given the results on absolute beta convergence with the quadratic model, the conditional beta convergence is reprocessed with the inclusion of the square of initial income gap as an independent variable. However, the model did not give statistically significant results at 5% significance level.

CONCLUSION

Since the 1980s there has been a growing interest on endogenous sources of growth. Beginning with the contributions of Romer (1986) and Lucas (1988) a considerable interest has been given on physical as well as human capital accumulation, knowledge spillovers and externalities, innovation, product differentiation and international trade in terms of their impact on long run economic growth (Nijkamp and Stough, 2000). The bases of this recent debate have been the recognition of the non-rival component of technology or knowledge, which gave way to the existence of knowledge externalities and spillover effects and the rejection of the neo classical assumptions of constant returns to scale and decreasing returns to factors of production.

Elimination of the basic assumptions of the traditional growth model, have had important implications for growth rate differentials and the convergence of growth rates. New growth theories pointed to dynamic equilibrium in the long-run growth path and variation in initial conditions and made use of the convergence hypothesis to prove the absence of convergence and steady-state growth across countries and regions of the world.

Subsequently, a considerable amount of empirical studies have emerged, which have directed attention to explaining growth rate differentials across countries and regions by using cross-section or panel data. As a result, there appeared a large number of empirical researches making use of the concepts of convergence, divergence, catching-up and falling-behind. These studies have attempted to present evidence on the capacity of new growth models to explain the process of convergence and have highlighted a variety of factors in explaining this process, with extensive emphasis on human capital. One line of this research has focused on the advantages of falling behind, which gave way

to the a faster growth of poor economies and catch-up the leader ones; while the other has emphasized the existence of some factors that slowed down or hindered the process of convergence between the advanced and poor economies.

This thesis attempted to investigate the regional income growth disparities in Turkey by making use of the convergence hypothesis in the framework of new growth models. It first attempted to examine the evolution of regional income growth differences in the period 1980-2000 in relation with the developments taking place in the Turkish economy. Second, by defining human capital in terms of education, innovation and learning, and entrepreneurship, it attempted to explore the contribution of broadly defined human capital differences towards explaining income growth differentials among Turkey's provinces.

A detailed analysis of the evolution of regional disparities showed that convergence of per capita income among the provinces in Turkey indicated a fluctuating trend in the period between 1980 and 2000. Nevertheless, the years after 1980 could be divided into four broad phases. In the period *1980-1989*, when the economy was experiencing growth in terms of per capita income, income disparities among the provinces tended to increase. In contrast, a temporary trend towards per capita income convergence characterized the period *1989-1992*, when growth rates of per capita income indicated fluctuations, reflecting unstable crisis conditions. The situation was reversed in the *1992-1995* period and per capita income disparities among the provinces tended to increase. This period coincided with declines in per capita income growth rates and a subsequent collapse of the economy in 1994. Finally, more recently a process of convergence took place in the *1995-1999* period. First years of this period after the 1994 crisis were characterized by increases in annual growth rates of per capita income, while the situation was reversed and resulted with a big financial crisis in 1998, which had severest declines in per capita income of the metropolitan regions of the country.

On the other hand, the general conclusion reached by most of the empirical studies in the literature that any positive trend reflected by increases in annual

growth rates of per capita income is in parallel with a trend of regional per capita income convergence; while when a negative trend prevails in per capita income growth, income differences of provinces tend to increase seem not to hold for the Turkish case. In fact, any trend towards convergence should be carefully interpreted. An attempt to relate the evolution of regional disparities to the national growth experience would be misleading. The Turkish economy is characterized by fluctuations in per capita income growth rates as a reflection of crisis conditions. Especially after the 1990s, financial crises dominated the national economy, which resulted in serious declines in the growth of the most advanced areas of the country. Explaining any trend towards per capita income convergence by income growth rates might hide the persisting income growth differences among the provinces of Turkey.

The analysis of absolute beta convergence provided us with a detailed examination of income growth rate differentials verified these findings. Overall, the results for the period 1980-2000 pointed that there was no tendency for income growth rates of provinces to converge to the national average. In fact, the trend was rather the reverse, provinces in Turkey tended to fall behind the national average in terms of per capita income growth.

The obtained results for the period 1980-2000 made it possible to define four groups of provinces in terms of their growth rates and initial income levels. The first group, is characterized by high levels of initial per capita income and growth rates lower than the national average. It is composed of the most dynamic *metropolitan regions* of Turkey, which dominate the economy (İçel, İstabul, İzmir and Kocaeli). For these provinces, the convergence hypothesis that regions with lower per capita incomes at the beginning would grow at a faster rate and indicate a trend towards convergence seems to hold true. The second group, *dynamic growth regions*, consists of provinces with initial income levels lower than or relatively closer to the national average accompanied with growth rates superior to the national average. Among these provinces are those located in proximity to the metropolitan areas along with the main transportation axes (Ankara, Bolu, Bursa, Kırklareli, Manisa, Sakarya

and Tekirdağ), those provinces defined as the success stories of the country following a self-development path after the 1980s based on their local capacities (Çorum, Denizli, Gaziantep, Kahramanmaraş) as well as some regional centers (Diyarbakır, Mardin, Urfa). It seems that this group of provinces succeeded to reactivate their capacities, adapted well to the changing conditions and changed their unfavorable initial income levels in favor of higher growth rates. Quite inferior initial income levels and growth rates significantly lower than the national average, however characterize the third group of provinces, lagging regions. This group consists mostly of the provinces located in the eastern and northern part of Turkey. Lastly, the fourth group consists of a few provinces, which stand distinct from those of the third group with their extremely low initial income levels and income growth rates (Ağrı, Bitlis, Erzincan, Erzurum and Muş).

In fact, evidence of the overall income growth process between 1980 and 2000 showed that, although a group of provinces with low levels of initial income showed a renewed dynamism for widening their competitive base and achieving successful growth reflected by above average income growth rates, income growth differences persisted from the 1980s until 2000. The existence of a large group of provinces with very low initial conditions and income growth rates pointed a dichotomy that a group of provinces diverged and fell behind the rest of the country.

In fact, the findings of a further analysis pointed that the regional income growth of Turkey lied in different convergence patterns of two quite distinct clubs of provinces: those which had per capita income growth rates superior to that of the nation in the analyzed period (1980-2000), accompanied by initial per capita income levels higher or lower than the national average as opposed to those, which started with smaller than average income levels in 1980 and indicated income growth rates lower than the national average between 1980-2000. The results presented evidence that these two clubs of provinces have behaved in a different way in the period 1980-2000. The analysis for the first club showed that income growth differences among the provinces of this group

tended to decline between 1980 and 2000. However, the second club of provinces, which had drastic income gaps from the national average at the beginning of the period, showed a tendency towards divergence in the 1980-2000 period and behaved in contradiction with the convergence hypothesis. Yet, almost half of the provinces within this group indicated income growth rates quite lower than the group average.

Obviously, one force impeding the convergence process may be the presence of cumulative processes in economic growth. In Turkey, economic activities and population are concentrated in a few metropolitan core areas as a consequence of cumulative processes. It seems that, on the one hand, some provinces adjacent to the metropolitan areas and located along the main transportation axes and on the other hand, some provinces which followed a self-centered growth focusing on their historically developed local capacities took advantage of the spread effects from the most advanced regions. Clearly, the former seem to have profited from the spread effects or spillovers from the dynamic growth regions. For these provinces distance stands as an important factor in their growth process. The latter, on the other hand, seem to have been more capable of adapting to the rapidly changing conditions of the increasingly liberalized and competitive market after the 1980s. The result is that these two groups of provinces were able to move closer to the national average income growth rate. However, a considerable number of geographically peripheral and economically lagging areas could not profit from either processes. Distance stands as a factor that prevents them to profit from the successful regions and the economic conditions after the 1980s were unfavorable for them, which resulted with a divergence process for them from the rest of the country.

Apparently, the concentration of economic activities and population in a few metropolitan areas while leaving the lagging ones at the other side signals serious problems for both clubs of provinces. As a matter of fact, this process, on one hand leaves the latter with a risk of creation of local capacities or deterioration of existing ones and on the other hand creates over accumulation of activities in the latter and hinders the restructuring or modernizing processes

(Camagni, 1992). Furthermore, supplementary analysis pointed to increasing disparities not only between the two quite distinct clubs of provinces but also within them. Although the group of provinces defined as dynamic growth regions indicated increasing income growth and seemed to catch-up the others, the difference between them and the metropolitan core regions in terms of initial income levels and income growth rates seem to persist. Similarly, the income growth convergence trend of the relatively disadvantaged group gave the warning sign for these provinces of having been excluded not only from the rest of the country but even from the provinces within this group, which indicated similar initial income levels and income growth rates.

As a matter of fact, further analysis verified these general and rough findings about regional convergence in Turkey over 1980-2000. Results indicated that regional convergence/divergence is a complex process and provinces showed different convergence patterns depending on their initial income levels. To be specific, rather than talking about a general trend of regional divergence over the 1980-2000 period in Turkey, processes of convergence and divergence coexist among two different groups of regions. Some provinces which had higher than average initial income levels tended to converge while for those which had lower than average initial income levels, income growth disparities increased significantly. Within the previously defined Club 1, most of the provinces tended towards convergence while there are still some provinces, which could not tend to catch them up. One interesting result is that those provinces, which indicated successful growth after 1980 based on their local capacities, appeared not to catch the others up. For Club 2, on the other hand, most of the provinces tend to deteriorate in terms of per capita income but there are some, whose initial income gap from the average is relatively lower, which indicated convergence.

Hence the findings provided evidence for the persisting differential income growth pattern among the provinces of Turkey since the 1980s. This tendency, which leaves a considerable number of provinces, most of which are located in the eastern and northern part of Turkey, at the other extreme against the

dominance of a club of provinces composed of metropolitan cores and an adjacent group of dynamic provinces, which tended to catch-up the former over the rest of the country stands as a crucial problem. Obviously, the problem is more important than being a question of a group of provinces with a dynamic growth pattern and another with increasing gaps from the national average. The question somehow concerns the take-off of a group of dynamic regions. The fact that these regions are more successful and stand out from the national economy, leaving the ones with inferior initial conditions, limited resources and capacities with increasing growth gaps raised important questions about the sensitivity of national and regional policies to the lagging regions. These policies are of great importance, given the differential geography of economic growth, where processes of convergence and divergence coexist among different groups of regions rather than a general tendency of provinces towards catch-up. It is apparent that the process of convergence and the analysis of income disparities are more complicated than the simple explanation of the theory and there are many other factors behind this process.

Analysis of conditional beta convergence indicated that human capital differences have a considerable role in explaining the persisting regional income growth differences in Turkey since 1980. The findings provided evidence for schooling component of human capital as the basic factor, especially for the lagging regions, that has significant impact on income growth differences among provinces in Turkey, while regional differences in innovation and learning capacities and entrepreneurship do not explain income growth differences significantly. The latter finding, obviously, can be explained by the underdevelopment of the economy in general. Nevertheless, it would be worth underlining some important points in interpreting these findings, which contradict with the usual arguments in the literature on the importance of innovation and entrepreneurship.

Many empirical studies, those based on face-to-face questionnaires, mention the local innovation capacity, entrepreneurial culture, informal and cooperative relationships as the success factors behind regional growth (Eraydın, 1992,

2002). However, the data used here, and in most of the studies on convergence is based on formal data, which is rough and unfortunately insufficient to take into account the detailed definition of the concepts of innovation and entrepreneurship. The use of rough indicators in the model ignores the real life situation and may distort the results. This is usually the case when patents and R&D personnel are used as indicators of innovation and technology. Especially for the less developed regions, existing innovative capacities are not formalized as patents. Yet, there are studies, which point to some reasons for not applying for a patent, although there exists new knowledge that contributed to their economic growth (Edquist et al., 2002). Besides, it is not possible to include other forms of innovation, like incremental innovation in the model when formal data is used.

The same problem holds for entrepreneurship as well. The use of firm open-ups may be too rough to analyze the role of it, since other forms of entrepreneurship are emphasized in the network economy to be important in regional growth (see Nijkamp, 2003 for a recent, detailed work on entrepreneurship). For example, Plummer and Taylor (2000) emphasize that entrepreneurial culture is not only composed of processes of new firm formation and new job creation but also of cooperation, which brings people together to exploit business opportunities. Apparently, the data used in these models ignore these issues and lead to unsuccessful and statistically insignificant results in most of the studies. It seems that a broader focus on the innovative and entrepreneurial capacities of these regions as components of human capital is necessary to be taken into account in the models to understand the growth dynamics of these regions.

Another point to be emphasized as a factor, which might distort the results and emphasized by other authors as well (see Cuadrado-Roura et al., 1999, 2000; Cuadrado-Roura, 2001) is that the results of the convergence model depends on what kind of data used. It may lead to different results depending on whether GDP is used as PPS or real values, or whether the income variable is used as

GDP or GDP per capita, per worker etc. This is why different studies may find different results.

In addition to that, results based on growth rates may lead to wrong conclusions. Working on growth rates becomes problematic in cases like Turkey, where there are important differences between units, in this thesis between provinces in terms of per capita income. Behind the theory, there is the assumption that units are homogenous. However, when we work with more heterogeneous units, it becomes difficult to find empirically the predictions of the model. In such cases, a minor improvement is reflected by considerable increases in growth rates, although its real effect does not mean much. Besides, it becomes necessary to conclude about regional convergence/divergence with caution.

Obviously, more recent models of endogenous growth take into consideration much of these problems and attempt to work on making convergence models more realistic. They try to integrate structural variables, proximity externalities and networking as factors explaining the process of economic growth.

In spite of the problems sketched above, the convergence model used in this study helped to investigate income growth and analysis of regional disparities. It gave a general idea about how regional income evolved over time and whether there were differences among the regions and whether they tended to catch-up. The differential convergence pattern persisting since the 1980s, briefly sketched above signals the urgent need for regional development strategies for these groups of provinces, which will aim the integration of the lagging regions in the national economy and transformation of this differential pattern of income growth towards that of convergence.

Obviously, there are many ways for achieving this but the findings indicate that even focusing on basic schooling capacities would contribute to reducing income growth differences and eliminating the differential income growth pattern among provinces in Turkey. Regional policies focusing on upgrading the existing human capital capacities through the enhancement of educational

capacities would provide a growth and development scheme for the different groups of provinces and help eliminating the differential growth pattern. On the other hand, when the long time lag between human capital investment and returns to human capital, especially with regard to education is considered, a reduction in income growth differences would come out in the long run. Nevertheless, with policies on increasing the human capital potentials of regions the lagging areas could be provided with some help to be integrated to the national economy and regional income growth differences could be reduced.

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