CONVERGENCE ACROSS TURKISH PROVINCES

AND SECTORAL DYNAMICS

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1. Introduction

During the last ten years there has been a vast literature on economic growth. The emphasis in these studies following the work by Barro (1991), Barro and Sala-i-Martin (1992) and Mankiw, Romer and Weil (1992) were more on forces that determine convergence across economic units. The lesson learned from this literature is that there is some regularity in economic growth. Using cross sectional analysis it is found that there is no evidence of convergence in absolute terms across broad sample of countries. One obtains convergence of two percent per year once differences in fundamentals across countries are controlled for. That is, poor countries are growing faster than the rich ones only conditionally. However, when the analysis is restricted to more advanced nations, such as OECD countries or countries in Maddison (1991) data set, there is also some evidence of unconditional convergence.

Empirical studies on economic convergence are also extended to convergence across regions of countries. While the neoclassical theory assumes closed economy, and if simply applied to open economies the speed of convergence becomes infinity, the existence of some sort of immobility ensures that even the regions will follow similar pattern as nations (Barro, Mankiw, Sala-i-Martin (1995)). The regional studies by Barro and Sala-i-Martin (1991,1992,1995) for states within U.S., Europe and Japan, by Shioji (1996) for Japan, by Coulombe and Lee (1995) for Canada and by Persson (1994) for Sweden conclude that there is indeed convergence across regions of the countries under investigation and, once again, the speed is around two percent. Yet, this time the nature of convergence is absolute, as regions within national boundaries are more likely to share similar economic and social characteristics.

Almost all of the regional studies are restricted to regions within developed nations because of the lack of data, except one by Cashin and Sahay (1996) on Indian states. One purpose of this paper is to extend regional convergence literature to regions within developing countries by examining the case of Turkey[1] and ask the question whether the regularity observed for regions within advanced nations also holds for developing countries. The conclusion of this paper is that the answer is negative. Similar to Cashin and Sahay (1996) where they find that Indian states converge at a speed of one and an half percent per year only if they control for sectoral shocks, Turkish provinces diverge in absolute terms, yet when regional dummies are introduced, the result is overturned and the estimated rate of convergence is very close to 'magical' two percent.

A second goal of this paper is to examine the source of inequality across provinces in Turkey. In his 1996 article, de la Fuente suggests that the rate at which technology diffuses and changes in sectoral composition may generate great income disparities across regions. Similarly Bernard and Jones (1996) document that convergence pattern varies across sectors and composition of sectoral output exhibits heterogeneity across states in the U.S. The lack of data, unfortunately, makes it impossible to investigate the contribution of technology and its diffusion as done by de la Fuente (1996) for Spanish regions. Nevertheless, the data contains information on sectoral outputs. Following de la Fuente (1996) and Bernard and Jones (1996), this paper also attempts to emphasize the importance of sectoral structure on convergence process.

In the case of Turkey, the effect of sectoral structure on regional inequality becomes more interesting because starting from mid-1960s Turkey prepares Five-Year-Development Plans in which the main emphasis is given to sectoral development. The import-substitution policy is thought to be supported by five-year plans such that these plans detemine what and how much should be produced by the domestic economy. While almost all plans mentioned

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[1] Turkey is the poorest member of the OECD with significant differences in fundamentals relative to other countries in the group and, consequently, considered as a developing rather than a developed country.

regional planning in none of them the relation and co-ordination between sectoral development and regional development is well specified. Instead, first regions, then even small districts are classified according to their development level. The underdeveloped regions are given ‘priority in investment’ which simply meant investment incentives in terms of tax credits to private sector rather than infrastructure investments by the public. After 1980, when Turkey started implementing an export oriented policy, the plans become only lists of recommendations which have not benn taken seriously by the governments.

In Section 2 of this paper we provide an extensive description of existing regional inequality in Turkey. Section 3 presents estimates of convergence using cross-sectional regressions. Section 4 introduces changes in sectoral composition as a possible source of the observed dispersion. This section also includes a comparison of Turkish experience with two European countries, Italy and Spain. Section 5 concludes.

2. Dispersion and Distributional Dynamics

In this section we provide a first view of regional disparity in Turkey. The data used in this paper are annual provincial gross domestic product per adult population for years 1975 to 1995. The values of provincial GDP for years 1987 to 1995 are from State Institute of Statistic of Turkey (SIS). Data for earlier years are obtained from Özötün (1980,1988). Per capita terms are calculated using population figures from General Population Census (GPC) conducted by SIS every five years except 1995. In between years as well as for years after 1990 are projections estimated using age-gender group specific survival rates.

A most commonly used measure of the degree of dispersion is coefficient of variation in income levels. Figure 1 reports coefficient of variation (measured as standard deviation of relative income levels, that is, deviations of log GDP per adult population from its sample mean) of per capita income in 65 Turkish provinces. When we consider the beginning and end of the sample we observe that the dispersion has increased drastically in the last twenty years. Yet, the pattern is not monotonic over the entire sample.

Indeed, the dispersion decreases during the second half of the seventies. The end of seventies in Turkey marked by high inflation and unstable political environment that resulted in major changes in economic and political environment. During the last two years of seventies we see that the dispersion rises very rapidly. In early 1980 a new economic program that ended countries long-lasting import substitution policy and initiated new export oriented approach is accepted. At the end of the same year military seized power on grounds to stabilize politics and end social unrest. During the first three years of the eighties when military was in power, the 1980 level of dispersion is sustained. After 1983, the power is returned to civilians. Civil governments pursued a policy aimed to increase capital accumulation and promote exports, but evidently distorted income distribution across provinces severely and in 1989 income dispersion reached its peak since the beginning of our sample. The first half of the nineties political competition which was suppressed until then by prohibiting politicians of the era before military intervention from politics, increased leading governments to follow populist policies. During this time period while a mild improvement is observed in distribution, the differences across provinces' income levels remained significantly large.

In Figure 2 we plotted the dispersion within the top and bottom quintiles of provinces. It should be noted that most of the rich provinces are either from Marmara region (Istanbul and its periphery) or historically major port cities along Aegean and Mediterranean coast, whereas poor provinces are located at the East and Southeastern part of Turkey and north of Central Anatolia. Similar to the Italian rich north and poor south (Paci and Pigliaru, 1998), at the beginning of the sample the dispersion among rich provinces are two and a half times higher than the dispersion within the poor. Over time, the dispersion within the rich group decreases indicating convergence among these provinces. The picture is completely different when we consider poor provinces. The dispersion rises especially in 1980 and 1984 abruptly and reaches a level in 1993 that is almost twice of the level of 1975. The figure indicates that rich prvinces are converging towards each other, whereas poor provinces are becomes more dispersed.

The analysis based on the coefficient of variation indicates richer dynamics in the evolution of the distribution. We now turn to a more general analysis of income distribution, which explicitly models the evolution of the entire distribution of income levels across provinces over time. The methodology proposed by Quah (1993, 1996a, b, c) is based on the assumption of first order stationary dynamics for the distribution of income levels. Let F_t denote the distribution of income across provinces relative to the mean at time t. The evolution of the distribution is governed by the following equation of motion:

$$F_t = M F_{t-1} \tag{1}$$

where M is the matrix that maps distribution at time $t\text{-}1$ into distribution at time t. Iterating this matrix forwards we can obtain future cross-section distributions:

$$F_{t+k} = (M\,M\,M\,M \ldots M)F_t = M^k F_t \tag{2}$$

Furthermore letting k to go infinity, we obtain the implied ergodic distribution (or long-run cross-section distribution) of income levels. Then transition probabilities of economic units from one (in practice, discretized) segment of distribution to another is estimated empirically by counting the number of transitions out of and into each state.

First panel in Table 1 provides the estimated one-step annual transition probability matrix and beginning-of-the-sample, end-of-the-sample and ergodic distribution for Turkish provinces. The numbers in the first row of the table shows the upper end of relative income levels in each state. The discrete states are determined such that there are equal number of provinces in each state initially. The first column shows total number of province-years in each row. Thereafter, each row denotes the estimated probability of transition from one state to another.

We observe high probabilities in diagonal entries indicating high persistence. More remarkably, however, are the probabilities in the first and last elements of the diagonal, both significantly higher than the others and above ninety percent. These values imply the possibility of two distinct clubs at the two ends of the distribution. Unlike previous studies of Quah (1993, 1996a, b, c) on the distribution of world income we find significantly high mobility in the middle of the distribution, with more or less equal chance of moving up or down. For example, any province initially at state two has thirty percent chance to move out of its current state. While with 14.4% probability it may drop to lower income level, it has marginally more chance to move up and even 1.0% probability to move into the richest state. Initially e assumed equal number of provinces in each cell, that is, a uniform distribution. At the end of the sample, the distribution emerges as a bimodal distribution, both modes at the extreme ends of the distribution. The ergodic distribution is not any different than the final distribution, possibly indicating more polarization.

The second panel in Table 1 shows the estimates of 20-year transition from 1975 through 1995. We still observe high persistence, not as pronounced as before, yet the difference of the persistence at the endpoints of the distribution and the middle is much larger. Furthermore, we see that the upward mobility increases with initial income level becomes higher. That is, there is faster convergence at the top of the distribution then the bottom.

From the analysis above it seems that the distribution of income in Turkey becomes bimodal, implying the existence or forming of convergence clubs. The analysis, here is consistent with our observation of higher dispersion over time. It adds more to that by showing that the observed dispersion is not a consequence of outliers.

3. Cross sectional convergence

In the previous section we provided a detailed description of distribution dynamics of provincial income in Turkey. In this section we use a more formalized concept of convergence and empirically test whether provinces are converging towards each other or are there significant differences in the steady states provinces are converging to.

The neoclassical growth theory with standard decreasing returns to reproducible factors assumption yields the following transitional dynamics of the output per capita around the steady state:

$$ln(y_t) = e^{-\beta T} ln(y_0) + (1 - e^{-\beta T}) ln(y^*) \quad (3)$$

where y_t is the output per capita y_0 and y^* are the initial level and the steady state level of output, respectively. Equation (3) implies that the average growth rate of output per capita over an interval from time 0 to time T is

$$(1/T) [ln(y_T) - ln(y_0)] = x + [(1 - e^{-\beta T})/T] [ln(y^*) - ln(y_0)] \quad (4)$$

where x is the growth rate of steady state level of output. Holding steady state and convergence rate constant across time and economic units, Equation (4) shows that the growth rate of output is negatively related to initial level of output.

Figure 3 plots average growth rate in the last twenty years in Turkish provinces against initial level of (log) output. The trend line in this graph is upward sloping predicting that the higher the initial income level the higher is the growth rate. Exclusion of two provinces from the sample that are at the upper end of the initial distribution, namely, Istanbul, the largest and most developed city in Turkey, and Zonguldak, a mining town that lost its significance especially in nineties, makes the slope much more steeper.

To quantify observed divergence the following equation is estimated:

$$(1/T) [ln(y_T) - ln(y_0)] = a - [(1 - e^{-\beta T})/T] ln(y_0) + u_{i0,T} \quad (5)$$

where $a = x + [(1 - e^{-\beta T})/T] ln(y^*)$ and $u_{i0,T}$ represents the average of the error terms between dates 0 and T.

Table 2 presents the estimates of convergence rate, β, in Equation (3) for various periods and specifications. The output series used in estimation is logarithm of per capita output measured in deviations from the sample mean in each period.

First column of Table 2 shows the estimates of convergence rate, β, in Equation (5) for various periods by holding steady state constant across 65 provinces in the data set. The sign of β coefficient is positive only for the third period, however insignificant in all cases except the second five-year period. If β is jointly estimated for all four periods and is constrained to be same across periods, an estimate of –0.007 (s.e. =0.003) is obtained. The estimate which is significant at 5% level means that Turkish provinces are diverging from the mean around 0.7 percent every year. The likelihood ratio statistic shows that the estimate of β is also stable across periods.

The figure and first set of regressions conclude that there is no absolute convergence across Turkish provinces. That is, holding steady states constant across provinces the results indicate divergence from the mean. The second column in Table 2 reports β coefficients obtained from the regression with regional dummies that are included to control for differences in steady states. There is some improvement in the convergence coefficients. The sign of the convergence rate for the first sub-period becomes positive and significant. While magnitudes of the second and third sub-periods improve they are not significant. Similarly, the results obtained from joint estimation shows some improvement from negative and significant coefficient to positive yet insignificant coefficient of 0.004 (s.e. =0.005).

In the literature one variable which is usually significant in convergence regressions is some indicator that controls for sectoral composition. Barro and Sala-i-Martin (1995) use this variable to control for aggregate shocks that affects groups of regions differentially, such as shifts in the relative prices of agricultural products or oil. To control for such effects we include the share of agricultural output in the initial year to the estimated equation

Third column of Table 2 shows estimates of convergence rate after share of agriculture is included in the regressor list. Separate estimates for each period do not show any changes relative to the previous estimates. Nevertheless the jointly estimated β coefficient indicates, now, that the provinces are converging at a speed of 1.7% per year (s.e. =0.007). Moreover, the restriction for the convergence rate across all four sub-periods is also accepted. One can, then, conclude that the Turkish provinces are converging at a speed of around two percent per year, very much like their counterparts in developed world, but unlike them convergence across Turkish provinces is just conditional.

4. Sectoral dynamics and convergence

Most of the studies on convergence have concentrated on aggregate output level. There are very few studies investigating convergence pattern across sectors of regions. The first attempt has been made by Barro and Sala-i-Martin (1991), where they look at the sectoral convergence across the states of the U.S. They conclude that β-convergence applies within sectors similar to the ones for aggregates and that an important part of overall convergence across states can be explained by adjustment process of convergence across sectors. Bernard and Jones (1996) examine sectoral convergence across U.S. states more thoroughly and conclude that there exist large heterogeneity in productivity levels across sectors and states and while productivity growth in manufacturing provides the main source of convergence across states. They also find that changes in the composition of sectors also affect the process significantly and inversely as employment shifts from more productive sectors to less productive ones. Similarly, de la Fuente (1996) investigates convergence across sectors and regions of Spain. He also concludes that changes in sectoral composition affects convergence process, but unlike Bernard and Jones (1996), he reports that the flow of labor in Spain is more from low productive sectors, specifically from agriculture, to more productive ones. Similarly, Paci and Pigliaru (1997a, 1997b and 1998) in three different studies reach the same conclusion for entire Europe and Italy. They also claim that initially dualistic structure in Italy causes rapid convergence and when the employment flow from low productive to high productive sectors end, the convergence process slows down.

It is already a well-known fact in regional economics literature that sectoral composition plays an important role to explain differences in productivity across regions. Indeed, to the extent the average productivities exhibit significant variation across sectors, sectoral composition can be thought as a determinant of dispersion across regions. Furthermore, if some sort of non-constant returns to scale exist, such as economies of agglomeration proposed by Krugman (1991), then the differences and high mobility across sectors may explain observed pattern of convergence (or divergence). This section deals with the assessment of the effects of sectoral composition and sectoral convergence on the overall convergence process across Turkish provinces.

4.1. Sectoral Productivity Levels and Growth Rates

The sectors analyzed here are agriculture, industry, construction and services. Sectoral employment data exist only between 1975 and 1990 and at five-year intervals. This leaves only four observations per unit. In this section I also define aggregate productivity as the sum of output by sectors mentioned above and output per employee instead of output per adult population.

In Table 3, we summarize data on employment and output shares of different sectors. Agriculture is the only sector whose share in employment has declined in the fifteen years we observe. Yet, agriculture dominates the employment even in 1990 with a share of over sixty percent. In terms of output, share of agriculture declines much rapidly (almost forty percent in fifteen years), and in 1990 agriculture loses its dominance to services.

Sectoral dispersion is also reported in Table 3. Labor share of agriculture spans from a minimum in Istanbul (10%) to a maximum in Muş (90%) with coefficient of variation of 18% at the beginning of the sample. The table shows wider dispersion in other sectors. In industry, the ratio of the province with minimum labor share in industry to the province with the maximum share was thirty-two. Over time, the dispersion in agriculture increases while its share declines. The opposite is true for other sectors. The dispersion measured as coefficient of variation rapidly declined in industry from 0.85 to 0.69. When we consider output shares, we observe similar or wider dispersion in all sectors but services.

Evidently Turkey is still an agricultural economy despite the fact that agriculture is losing its significance. Throughout the fifteen years that constitutes our sample employment flew from agriculture to other sectors, especially into services. Nevertheless, the agriculture is still the major occupation of Turkish people. With these properties, Turkey is significantly different from Europe. In Europe the average share of agriculture in employment is 6.5% with a maximum of 48% in 1990. Even in the southern Europe which has been considered the lagging region of Europe, the average share of employment in agriculture is 15.2 per cent (Paci and Pigliaru, Table 1, (1997a)).

Figure 4 presents the evolution of sectoral productivities over time. The variables are defined as deviations of logarithm of sectoral productivity from the logarithm of aggregate productivity level in each period. The difference between productivity levels across sectors is remarkable. The productivity level in agriculture has been consistently below of the productivity levels of other sectors. Productivity in construction was highest at the beginning of the sample but shows some decline over the last fifteen years. As of 1990, most productive sector in Turkey is industry, more than two and an half times higher than the aggregate.

Table 4 completes the figure by presenting sectoral productivity levels, measured in 1987 TL and averages of provinces. Table 4 also provides coefficient of variation within sectoral productivity levels. The variation across sectors is matched by variation across provinces. The standard deviation of aggregate productivity level is over fifty percent of the average in both 1975 and 1990. While productivity level is less dispersed across provinces in agriculture, the coefficient of variation in all sectors increased throughout the sample period. The variation in manufacturing is remarkably high. It increased from 66 percent at the beginning of the sample to 85 percent in 1990.

Table 5 provides sectoral growth rates. The average province grew at an annual rate of 1.5 percent in fifteen years whereas the growth of aggregate productivity in Turkey overall is 2.2 percent. Yet, sectoral growth rates in an average province are significantly different. While industry observed on average a one percent growth rate throughout the sample period, construction shows a decline. Furthermore, variation across provinces observed in levels is also found in the growth rates. Indeed, sectoral growth rates vary wildly across provinces.

Tables 4 and 5 indicate that the sectoral composition and differences in sectoral growth rates may be a reasonable way to explain the observed income inequality across provinces. Nevertheless, it is not evident from these tables to assess the relative importance of changes in productivity within a sector and changes in sectoral composition within a province. In order to establish a formal analysis we employ the decomposition technique described by Bernard and Jones (1996).

Let $y_{it}=Y_{it}/L_{it}$ denote aggregate productivity level for state i at time t. It is then the sum of weighted sectoral productivities over j sectors where weights are sectoral employment shares:

$$y_{it} = \sum_j \frac{Y_{ijt}}{L_{ijt}} \frac{L_{ijt}}{L_{it}} \equiv \sum_j y_{ijt} w_{ijt} \tag{6}$$

Productivity growth in every state, then, can be decomposed into a productivity growth effect and a share effect:

$$\Delta y_{it} = \sum_j \Delta y_{ijt} \overline{w}_{ijt} + \sum_j \Delta w_{ijt} \overline{y}_{ijt} \tag{7}$$

where the first summation is the within sector effect, or productivity growth effect, and the second one is the between sector effect, or share effect. The bars on variables indicate that the average value of that variable across two periods for which growth rate is calculated is used. It is also possible to reformulate the effects in terms of percentages:

$$\%\Delta y_{it} = \sum_j \%\Delta y_{ijt} \left(\frac{y_{ij0}}{y_{i0}} \right) \overline{w}_{ijt} + \sum_j \Delta w_{ijt} \left(\frac{\overline{y}_{ijt}}{y_{i0}} \right) \tag{8}$$

Table 6 reports in the top panel the average productivity growth effects and share effect for the provinces over fifteen years of our sample. The average annual percentage change in productivity is 2.14 percent, the contribution of improvement within sector productivity is 0.56 percent per year and the contribution of changes in sectoral composition is 1.58 percent per year. That is, if the sectoral composition had not change, the aggregate productivity would grow only 0.56 per cent per year, instead of 2.14 percent. This implies that the main source of productivity growth in Turkey between 1975 and 1990 is changes in sectoral composition rather than the improvement of productivity levels within sectors. Indeed, three quarters of the growth can be explained by this factor. Throughout this period both industry and services are leading sectors with almost equal contribution to aggregate growth. Yet, the contribution of industry is coming from both improvements in productivity level within this sector and increases in labor's share in this sector. On the other hand, the gain in services is entirely due to flow of labor into this sector.

The following three panels repeat the same analysis for three five-year sub-periods. Productivity growth is highest in the last sub-period and lowest in the first. A striking observation is that the productivity growth pre-1980 period is entirely due to sectoral shifts. In fact, within sector productivity growth is even negative in this period. In post-1980 period, on the other hand, the dominant source of growth is within sector productivity improvement. In the last two sub-period services are becoming more important in Turkish economy. This sector does not only attract more people it also exhibits strong and stable within sector productivity growth during this period.

4.2. Sectoral Convergence

The analysis above suggests that the aggregate convergence analysis maybe misleading or incomplete if one does not considered sectoral convergence patterns. We assume that relative sectoral productivities follow the following dynamic equation:

$$\Delta y_{i,t} = x_i - \beta y_{i,t} + e_{i,t} \quad (9)$$

where the term x_i refers to relative sectoral steady state and β is the convergence coefficient. Solving this model recursively gives us the equation to estimate:

$$y_{i,t} - y_{i,t-k} = [(1-(1-b)^k)/k]y_{i,t-k} + u_{i,t,k} \quad (10)$$

Table 7 presents the results of beta convergence. The sectoral productivity variables are measured in logarithms of sectoral output per employee and expressed as deviations from the inter-provincial average of logarithm of aggregate output per employee. There is no convergence at the aggregate level, as expected[2]. However, convergence rates vary across sectors significantly. While there is no evidence of convergence in agriculture, all other sectors converge at a high speed, ranging from 2.6 per cent per year in services to 18.9 per cent per year in construction. Estimates of long-run sectoral productivities also vary significantly across sectors. The estimated steady state of agriculture is far below than the average, whereas steady states of industry and construction are significantly higher than the aggregate.

Figure 5 shows the pattern of sigma convergence at the aggregate and sectoral levels. The dispersion in aggregate productivity increases until 1985 and since then it is more or less stable[3]. Similarly services exhibit an increase in dispersion until 1985 but then onwards there is a significant decline. For agriculture and industry we observe an increase in the dispersion of productivities across provinces. In fact, the dispersion increased sixty and forty percent in agriculture and industry, respectively. The only sector in which the dispersion of productivities has declined though very little is construction.

One can also analyze the contribution of sectoral composition and productivities to aggregate convergence. In order to establish this task, we will follow Marimon and Zilibotti (1998) and de la Fuente (1996) and construct two virtual economies. The idea is that we calculate the path of relative output in each province under two different scenarios. In the first one, we hold initial composition of employment constant and use the observed path of average sectoral productivities throughout the sample period. Under this scenario, any convergence or divergence is solely the consequence of convergence or divergence of sectoral productivities. In the second scenario we make opposite assumptions and hold initial average sectoral productivities constant and follow the observed path of the composition of employment. In this case, the convergence and divergence is the result of how closer or

[2] In this section our data runs from 1975 to 1990. Furthermore, we use total number of employees instead of adult population. Therefore we estimated the aggregate convergence equation.

[3] The difference between this figure and the one for output per adult indicates that the age distribution and labor participation rate may play significant role in convergence process in Turkey. Some studies discussed the effects of age distribution to convergence (e.g. Lindh and Malmberg (1996)).

diverse the employment structures become across provinces. Then we will use simple dispersion and cross-sectional regressions to these two virtual economies and compare them with the observed path of the aggregate productivities.

Figure 6 shows the pattern of sigma convergence for the observed pattern and two alternative scenarios. Observed dispersion across provinces increased from 1975 to 1985 and since then shows a slow decline. The first scenario, in which we hold initial employment structure constant, follows a similar pattern to the observed one, however, the increase in dispersion is relatively smooth at the beginning. The second scenario where initial productivity structure is held constant and employment structure is allowed to change shows a distinctly different pattern than the other two, especially after 1980. The dispersion that is increasing in the first sub-period declines under this scenario relatively fast and reaches a level below the initial level.

In Table 8 we report the cross-sectional regression results as well as coefficient of variation for the observed pattern and alternative scenarios. In the first two cases the coefficient of convergence is negative and in the last scenario it is positive, yet in all cases the coefficient is not significant. Our analysis of comparing the observed dispersion across Turkish provinces with two virtual economies indicates that the if there is any tendency for Turkish provinces to converge it is mostly due to the changing sectoral structure rather than the behavior of productivities. It seems more likely that the agglomeration and/or specialization increases the dispersion and flow of labor from low productive sectors, in this case agriculture, to high productive sectors helps to equalize income distribution across provinces.

4.3. Comparing Turkey with Southern Europe

It is also important to evaluate a country's performance relative to other countries. As our data spans a relatively short time period, it is quite possible that our results could be a consequence of the world conjecture rather than peculiarities of the Turkish case. Indeed, it is known that during the 1980s the convergence within the developed countries and their regions has somewhat slowed down.

In this paper we have chosen two Southern European countries as benchmarks to evaluate the Turkish performance. These countries are chosen not only by the availability of the data, but also by their relevance to Turkey. Both of these countries, namely Italy and Spain, are located at the Mediterranean. Italy is another country that has a long history of great disparity between its northern and southern regions which she, to some extent, still observes. Spain, on the other hand, joined the European Community as a poor partner in 1986 and since obtained massive grants from European Regional Development Fund, the largest structural fund of the European Union whose main aim is to correct 'the structural and regional imbalances which might affect the realization of economic and monetary union' (Neven (1995)). It should also be noted that Turkey was supposed to be a part of Europe at the same time as Spain, however she failed this opportunity for explicit political and implicit economic reasons, and looks like not be able to become a member of the European Union in the foreseeable future. Therefore, while being a member of the European Union do not improve regional inequality per se, the experience of Spain can be quite useful to imagine what would happen if Turkey were part of the European Union.

Spanish data covers years from 1955 to 1995 whereas Italian data goes back to 1960 and extends to 1991[4]. In Figure 7 we present the dispersion, measured as coefficient of variation, within the three countries. Until late 1970s the dispersion in Italy and Spain declines drastically. In early eighties this trend stops and we see slight increase in dispersion in both European countries as well as in Turkey. While Italy and Turkey follow somewhat similar inequality across their regions in the latter half of the 1980s, the Spanish experience is quite different. After Spain joined the European Community in 1986, the regional disparity in this country declines very rapidly. Apparently, the accession of Spain to the Community and

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[4] Spanish data are provided by Angel de la Fuente. Italian data are obtained from CRENoS. The details of the first data set can be found in de la Fuente (1996) and details of the latter data set is in Paci and Pigliaru (1998).

hence the ERDF funds helped Spain to correct the regional imbalances somewhat. Indeed, de la Fuente (1995) reports that 'ERDF grants reduce the dispersion of regional productivity by around 5%'.

The data on Italy and Spain also contains information about sectoral productivities. This allows us to examine the source of productivity growth in these economies and compare it to the Turkish case. We calculated within productivity effect and sectoral shift effect as defined in Equation (8) for both countries for the period 1975-1990 in order to be able to compare Turkish performance with these examples.

Table 9 reports the results. The total productivity growth in Italy and Spain are considerably higher than Turkey during the period under examination, 3.0% in Italy and 4.1% in Spain, compared to 2.1% in Turkey. Within sector productivity growth accounts most of the difference between Turkey and European countries. In fact, gain in productivity due to sectoral shifts in Turkey is twice of that of both Italy and Spain. This constitutes the major difference in the growth pattern in Turkey versus Southern European countries. In European countries, three quarters of the total productivity growth comes from the within sector productivity growth, whereas in Turkey only one quarter of total productivity growth is due to this factor. That is, in Turkey, re-allocation of labor from low productive sectors into high productive sectors seems to be the major source of growth, whereas the driving force in Italian and Spanish economies is improvement of productivity within sectors rather than re-allocation of labor across sectors.

A further observation shows that service sector is relatively more important in both Italy and Spain. Not only in terms of its share within the economy (around 60% of total employment or output in 1990), but also more than seventy percent of total productivity growth is attributable to this sector. Moreover, 25% to 45% of productivity gain in this sector is within sector productivity growth. However, in Turkey services contribute to total growth by only attracting labor from low productive agriculture, the contribution of productivity effect of this sector to total growth is negligible. These observations contribute to our earlier conclusion that Turkey is still an agriculture economy and the transition to an industrialized nation is an ongoing process. Throughout our sample period Turkish private sector seems to enjoy massive flows of employment from agriculture and desires no need to improve existing productivity.

One may be very cautious about the results presented above as they may be a consequence of the possibility that both Italy and Spain are ahead of Turkey in development process and hence the observed patterns reflect this difference[5]. Table 10 presents the decomposition of productivity in Italy and Spain prior to 1975. There is not much difference between the two sub-periods. In both countries the share effect of service sector becomes more important in the latter period. In Italy, while within productivity effect in industrial sector improved drastically over two sub-periods the service sectors contribution is mostly due to new employment in this sector. In Spain the only difference between the two sub-periods is that in the latter period, there is a stronger movement of labor out of agriculture into the services. The table indicates that Turkish experience is significantly different than the Southern European countries, even when we take into account of early years of development in the latter region.

5. Summary and Conclusion

A number of studies that have examined the growth dynamics of regions within the developed world have found that these regions are converging towards each other in absolute terms. However, our analysis shows that we cannot reach the same conclusion for provinces in Turkey. These provinces, although converging conditionally, display a diverging pattern. Our descriptive analysis predicts a bi-modal distribution for Turkish provinces, that is, there are two convergence clubs at the two ends of the distribution.

We used sectoral data to show to what extent sectoral composition and growth can explain the observed divergence. The peculiarity of Turkish example is that for the last thirty

[5] I thank Ana Revenga pointing out this possibility.

years Turkey is following Five-year Development Plans, all of which consider sectoral planning as the base for the development of the country and while accepting the importance of regional planning, never specify the relation between the two.

The data shows that the dominant sector in Turkey is still low productive agriculture. During the fifteen years of our sample we observe massive flow of labor from this sector to others, especially in services. In fact, three quarters of aggregate productivity growth comes from this sectoral shift. Our analysis also shows that the dispersion across provinces declines due to the flow of labor but increases because of the within sector productivity growth because the high productive sectors are agglomerated in certain provinces.

The Turkish example also forms a contrast to the Italian and Spanish experience. In both of these countries the productivity growth was much higher than Turkey and most of the growth in aggregate productivity is due to the improvement of sectoral productivities.

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Table 1:Transition Probabilities For Relative Income Levels, 1975 - 1995

One-Year Annual Transition					
Number	-0.292	-0.100	0.085	0.202	∞
299	0.916	0.080	0.003	0.000	0.000
202	0.144	0.693	0.139	0.015	0.010
233	0.004	0.133	0.695	0.146	0.022
182	0.000	0.000	0.192	0.626	0.181
384	0.000	0.000	0.016	0.068	0.917
Initial Dist.	0.200	0.200	0.200	0.200	0.200
Final Dist.	0.277	0.092	0.185	0.123	0.323
Ergodic Dist.	0.234	0.132	0.162	0.131	0.341

Twenty-Year Transition					
Number	-0.292	-0.100	0.085	0.202	∞
13	0.846	0.154	0.000	0.000	0.000
13	0.385	0.231	0.308	0.077	0.000
13	0.154	0.077	0.385	0.231	0.154
13	0.000	0.000	0.154	0.231	0.615
13	0.000	0.000	0.077	0.077	0.846
Ergodic Dist.	0.280	0.067	0.112	0.086	0.455

Table 2: Cross-sectional Convergence Regressions 1975 - 1995

	Basic equation		*Equations with regional dummies*		*Equations with share of agriculture & regional dummies*	
Period	β	R^2 [σ]	β	R^2 [σ]	β	R^2 [σ]
1975 – 1980	-0.006 (0.011)	0.004 [0.032]	0.034** (0.014)	0.327 [0.027]	0.041** (0.019)	0.2597 [0.0105]
1980 – 1985	-0.021* (0.006)	0.044 [0.023]	-0.017 (0.009)	0.171 [0.021]	-0.003 (0.014)	0.2000 [0.0223]
1985 – 1990	0.005 (0.008)	0.003 [0.038]	0.017 (0.018)	0.069 [0.037]	0.033 (0.022)	0.0939 [0.0390]
1990 – 1995	-0.003 (0.006)	-0.033 [0.026]	-0.009 (0.012)	-0.035 [0.026]	0.0011 (0.017)	0.2601 [0.0237]
Joint, 4 periods	-0.007** (0.003)		0.004 (0.005)		0.017** (0.007)	
LR statistics (p-value)	4.568 (0.206)		6.373 (0.095)		2.852 (0.415)	

Non-linear least squares estimation. Standard errors of estimates are in parentheses. * denotes significance at 1% level. ** denotes significance at 5% level.
The estimated coefficients for regional dummies and structural variables are not reported.
The likelihood ratio statistics refers to a test of the equality of the β coefficient over four periods. The p-value comes from a χ^2 distribution with three degrees of freedom.
Regional dummies are for Marmara, Aegean, Black Sea, Mediterranean, Central Anatolia, East and Southeastern Anatolia regions. See Table in the appendix for a list of provinces contained in each region.

Table 3: Evolution of Sectoral Shares

Employment Share				
1975	Average	Min.	Max.	Coef. Var.
Agriculture	0.758	0.105	0.903	0.177
Industry	0.067	0.010	0.320	0.847
Construction	0.027	0.008	0.065	0.497
Services	0.149	0.071	0.510	0.523
1990	Average	Min.	Max.	Coef. Var.
Agriculture	0.636	0.052	0.846	0.226
Industry	0.092	0.019	0.342	0.686
Construction	0.043	0.017	0.090	0.354
Services	0.229	0.111	0.572	0.357
Output Share				
1975	Average	Min.	Max.	Coef. Var.
Agriculture	0.561	0.020	0.832	0.293
Industry	0.131	0.012	0.682	0.907
Construction	0.059	0.013	0.167	0.570
Services	0.249	0.098	0.567	0.328
1990	Average	Min.	Max.	Coef. Var.
Agriculture	0.347	0.016	0.749	0.447
Industry	0.217	0.028	0.690	0.634
Construction	0.072	0.033	0.166	0.402
Services	0.365	0.129	0.579	0.290

Table 4: Sectoral Productivity Levels and Dispersion

	1975		1990	
	Average	Coef. of Variation	Average	Coef. of Variation
Productivity Levels				
Agriculture	978,847	0.284	1,113,224	0.470
Industry	5,079,535	0.663	6,778,433	0.845
Construction	5,563,940	0.594	4,081,622	0.635
Services	3,718,213	0.317	3,704,499	0.399
Aggregate	1,839,779	0.519	2,447,668	0.591

Averages are across provinces and expressed in 1987 TL.

Table 5: Sectoral Productivity Growth Rates and Dispersion of Growth Rates, 1975 - 1990

Growth Rates	Average	Turkey	Coef. Var.
Agriculture	0.43	0.88	5.391
Industry	1.08	1.09	3.684
Construction	-1.90	-1.32	3.069
Services	-0.32	0.78	5.752
Aggregate	1.51	2.20	1.405

Table 6: Sectoral Decomposition of Productivity Growth

1975-1990						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.27	13	-0.52	-24	-0.25	-12
Industry	0.49	23	0.59	28	1.08	50
Construction	-0.20	-9	0.35	16	0.15	7
Services	0.01	0	1.16	54	1.16	54
Total	0.56	26	1.58	74	2.14	100

1975-1980						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.34	105	-0.31	-94	0.04	11
Industry	-0.21	-63	0.34	104	0.13	41
Construction	-0.21	-64	0.24	74	0.03	10
Services	-0.42	-129	0.55	167	0.12	38
Total	-0.50	-152	0.82	252	0.33	100

1980-1985						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	-0.22	-42	-0.02	-4	-0.25	-46
Industry	0.38	70	-0.09	-17	0.28	53
Construction	0.20	38	-0.08	-15	0.12	23
Services	0.18	34	0.19	35	0.37	70
Total	0.54	101	0.00	-1	0.54	100

1985-1990						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.12	11	-0.16	-15	-0.04	-4
Industry	0.32	29	0.21	19	0.53	48
Construction	-0.18	-16	0.17	15	-0.01	-1
Services	0.39	34	0.26	23	0.64	57
Total	0.65	58	0.47	42	1.12	100

Productivity Growth Effect (PGE) indicates within sector productivity growth and Sectoral Effect (SE) refers to gain in productivity due to flow of labor from one sector to the other.

Table 7: Unconditional Sectoral Convergence, 1975 - 1990

	Aggregate	*Agriculture*	*Industry*	*Construction*	*Services*
Convergence Coefficient	-0.0052 (0.0055)	0.0090 (0.0108)	0.0582* (0.0140)	0.1893* (0.0351)	0.0256* (0.0086)
Sectoral Steady State		-0.0158* (0.0066)	0.0395* (0.0117)	0.0708* (0.0125)	-0.0051 (0.0067)

** indicates significance at 1%.*

Table 8: Dispersion and Convergence: Observed Pattern and Alternative Scenarios

	Coeff. of Variation		**Unconditional convergence**	
	1975	***1990***	***Beta***	***Std.err.***
Observed	0.519	0.591	-0.008	0.008
Employment Structure	0.519	0.577	-0.010	0.006
Productivity Structure	0.519	0.512	0.003	0.003

Table 9: Sectoral Decomposition of Productivity Growth in Turkey, Italy and Spain, 1975 - 1990

Turkey						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.27	12.5	-0.52	-24.2	-0.25	-11.7
Industry	0.49	22.7	0.59	27.6	1.08	50.4
Construction	-0.20	-9.3	0.35	16.2	0.15	6.8
Services	0.01	0.3	1.16	54.2	1.16	54.5
Total	0.56	26.2	1.58	73.8	2.14	100.0
Italy						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.28	9	-0.29	-10	-0.01	0
Industry	1.36	45	-0.33	-11	1.03	34
Construction	0.04	1	-0.16	-5	-0.12	-4
Services	0.54	18	1.55	52	2.09	70
Total	2.22	74	0.77	26	2.99	100
Spain*						
	PGE	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.57	14	-0.69	-17	-0.13	-3
Industry	0.91	22	-0.31	-7	0.61	15
Construction	0.44	11	0.06	1	0.50	12
Services	1.37	33	1.74	43	3.12	76
Total	3.29	80	0.81	20	4.10	100

* Spanish data is from 1975 to 1991.

Table 10: Sectoral Decomposition of Productivity Growth in Italy and Spain

Italy						
1963-1990	***PGE***	***%***	***SE***	***%***	***Total***	***%***
Agriculture	0.71	12	-0.65	-11	0.06	1
Industry	1.75	29	0.10	2	1.85	30
Construction	0.47	8	-0.20	-3	0.27	4
Services	1.66	27	2.25	37	3.90	64
Total	4.58	75	1.49	25	6.08	100
1963-1975						
Agriculture	0.76	11	-0.59	-9	0.16	2
Industry	1.22	18	0.54	8	1.76	26
Construction	1.03	15	-0.15	-2	0.88	13
Services	2.12	31	1.89	28	4.02	59
Total	5.13	75	1.69	25	6.82	100

Spain						
1955-1991	***PGE***	***%***	***SE***	***%***	***Total***	***%***
Agriculture	1.45	19	-1.39	-18	0.05	1
Industry	1.59	21	0.04	1	1.63	21
Construction	0.56	7	0.27	3	0.83	11
Services	2.72	35	2.51	32	5.23	68
Total	6.32	82	1.42	18	7.74	100
1955-1975						
Agriculture	1.18	19	-0.85	-13	0.33	5
Industry	1.44	23	0.37	6	1.81	28
Construction	0.31	5	0.25	4	0.55	9
Services	2.12	33	1.57	25	3.69	58
Total	5.05	79	1.34	21	6.39	100