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Does Income Converge in Turkey? an Empirical Assessment

Türkiye'de Gelir Yakınsıyor mu? Ampirik Bir Değerlendirme

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ABSTRACT

Turkey has recorded high growth rates during last two decades that have led to a structural change in the income level of the provinces. This shift arises to the question of whether the regional disparities in Turkey converge or diverge. The growth performance of Turkey has also led to change the structure of the economy which results in the move from rural areas to urban areas. The empirical examination of the income convergence in Turkey thereby seems to be timely and important in order to provide insights for analyzing the causes and consequences of regional disparities and connecting a link between economic growth and urbanization. We collect the per capita income data of 73 provinces during the period 1992-2013 and estimate different econometric models by controlling for structural changes in the income. The results overall provide an evidence on the income divergence between the east and west of Turkey. We discuss why Turkish urbanization which is in tandem with economic development process is not a stand-alone for the convergence and discover that the region-specific structural characteristics (the geographical conditions, the terrorist incidents, the regional investment policies, and the horizontal imbalances) seem to be still prevailing.

Keywords: Income convergence, Turkey, Structural shifts, Econometric modelling.

ÖZET

Türkiye'de, son yirmi yılda illerin gelir düzeyinde yapısal bir değişime neden olan yüksek büyüme oranları gerçekleşmiştir. Bu değişim, Türkiye'deki bölgesel farklılıkların yakınsayıp yakınsamadığı sorusunu ortaya çıkarmıştır. Türkiye'nin büyüme performansı, kırsal alanlardan kentsel alanlara geçişle sonuçlanan ekonomik yapının değişmesine neden olmuştur. Dolayısıyla, bölgesel farklılıkların nedenlerini ve sonuçlarını analiz etmek ve ekonomik büyüme ile kentleşme arasında bir ilişki olup olmadığını ortaya koymak amacıyla, Türkiye'deki gelir yakınsamasının ampirik incelemesi zamanında ve önemli gözükmektedir. Çalışmada, 1992-2013 döneminde 73 ilin kişi başına düşen gelir verileri kullanılarak ve gelirdeki yapısal değişiklikler dikkate alınarak farklı ekonometrik modeller tahmin edilmiştir. Sonuçlar, genel olarak, Türkiye'nin doğusu ve batısı arasında illerin gelirlerinde yakınsama olmadığına işaret etmektedir. Ekonomik kalkınma süreciyle birlikte gerçekleşen kentleşmenin neden yakınsama için tek başına yeterli olmadığı tartışılmış ve bölgeye özgü yapısal özelliklerin (coğrafi koşullar, terörist olaylar, bölgesel yatırım politikaları ve yatay dengesizlikler) hâlâ büyük ölçüde etkili olduğu tespit edilmiştir.

Anahtar kelimeler: Gelir yakınsaması, Türkiye, Yapısal kırılmalar, Ekonometrik modelleme.

1. Introduction

Turkey has relied upon the trade-oriented growth model and the incentive policies in the development process since 1980. The incentive system in 1980s were provided to the specific industries, in particular manufacturing sector. The main focus was to increase the investments and exports of the country. At the late 1990s and early 2000s, the incentive measures directly aimed the regional development. The policies for the regional development led to the rapid increase of big

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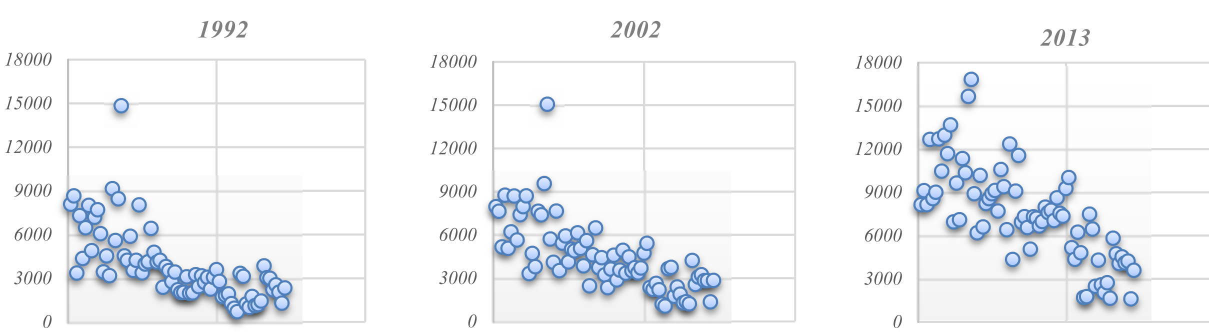
city populations which result in the development of different features and types of cities from region to region. Moreover, the differences between eastern and western regions have been gradually opened up. During the last decade, it seems a shift in the incentive system due to the ever changing local and international environment. The primary objective of the new investment scheme that has been prevailed since 2009 is to increase production and employment through boosting investment support for lesser developed regions.

Turkey as an emerging market economy has recorded high growth rates during last two decades. Figure 1 illustrates the real per capita income of 73 provinces in US dollars ($) with 2005 prices. The observation at a glance is that the income level was located at the range from $3,000 to $6,000 for thirty-one provinces in 1992 and thirty-eight provinces in 2002. The number of provinces decreased to thirteen for the same income level in 2013 where thirty-one provinces shifted to the income level between $6,000-$9,000. It is also conspicuous that while the number of provinces with the income higher than $9,000 was only two in 2002, it was shifted to twenty-one in 2013. These facts clearly indicate a structural change in the income level of the provinces. This shift brings up the question of whether the regional disparities in Turkey converge or diverge. The empirical examination of the income convergence in Turkey thereby seems to be timely and important in order to provide fresh information and new insights for analyzing the causes and consequences of regional disparities.

The growth performance of Turkey has led to change the structure of the economy- from agriculture towards industry and services- which results in the move from rural to urban areas. In theory, it is predicted that economic growth and urbanization move together hand in hand (Chen, 2002; Liu et al., 2016) and Turkish urbanization seems to be consistent with this prediction. The rate of urbanization was respectively 59 and 64 percent in 1990 and 2000. In 2012, Turkish provinces hosted more than 57 million people which nearly represents 75 percent of the total population. The rapid urbanization led to the concentration of production and consumption markets that promoted to Turkey's productivity-enhancing agglomeration economies. A tandem between economic growth and urbanization indeed reflects the structural shifts in Turkish economy (World Bank and TEPAV, 2015). From 1980 to 2013, while the total share of agriculture and industry decreased from 59 to 36 percent[1], the share of services in the economic structure showed a dramatic increase from 41 percent to 64 percent.

Although Turkey has reinforced a transformative urbanization and economic development over the past decades, she still keeps income and urbanization disparities between the east and west as represented by Table 1. The table also represents some stylized facts about the regional income and urbanization concentration because the highest income provinces are located in the western regions having a high urbanization and the lowest income provinces are located in the eastern regions with a low urbanization. The empirical examination of the income convergence in Turkey would also provide some insightful implications for the regional urbanization and income disparities.



Note: the real per capita income of 73 provinces in US dollars with 2005 prices.

Figure 1: Dynamics of the Income Level of Turkish Provinces

Table 1: Income and Urbanization of the Lowest and Highest Income Provinces

	Region	Income (1992)	Urbanization (1990)		Region	Income (2013)	Urbanization (2012*)
			Five lowest income provinces				
Kars	Eastern Anatolia	702	31.6	Şırnak	Southeastern Anatolia	1,587	64.0
Ağrı	Eastern Anatolia	935	36.3	Hakkâri	Eastern Anatolia	1,640	55.8
Tunceli	Eastern Anatolia	991	38.2	Ağrı	Eastern Anatolia	1,699	53.0
Muş	Eastern Anatolia	1,110	26.9	Kars	Eastern Anatolia	1,752	43.1
Bitlis	Eastern Anatolia	1,184	43.3	Muş	Eastern Anatolia	2,029	37.4
			Five highest income provinces				
İstanbul	Marmara	8,073	92.4	İzmir	Aegean	12,696	91.4
Bilecik	Marmara	8,440	51.5	Denizli	Aegean	12,956	70.6
Tekirdağ	Marmara	8,643	55.2	Manisa	Aegean	13,673	67.2
Bursa	Marmara	9,139	72.2	Bilecik	Marmara	15,654	75.9
Kocaeli	Marmara	14,837	62.2	Kocaeli	Marmara	16,837	93.4

Note: Income is the real per capita income in US dollars with 2005 prices. *The latest available data on the urban and rural population.

The literature for Turkey does not show a clear-cut evidence for the income convergence. As summarized in Table 2, the previous studies with the exception of Aslan and Kula (2011) employed either cross-section or panel data analysis. The cross-sectional and panel data approaches assume an equal rate of convergence across regions. Time series approaches on the other hand allow to differ the rate of convergence (Carlino and Mills, 1993). This flexibility may provide a useful tool in the case of Turkey because there are prominent differences among Turkish regions. Aslan and Kula (2011) analyzed the stationarity of relative income for Turkey's provinces by controlling for the structural breaks and employed the LM unit root tests of Lee and Strazicich (2003,2004). They found out a strong evidence in favor of the convergence across Turkey's provinces. Because this study also has motivated by the effect of structural breaks in the income level, it therefore seems to be required clarifying the differences between our study and Aslan and Kula (2011). The stationarity of relative income (stochastic convergence) is a necessary but not sufficient condition for convergence since convergence also requires that a province with a per-capita income below the national average must grow more than the national growth rate which is known as β convergence (Carlino and Mills, 1993). Our study hence differentiates from Aslan and Kula (2011) by examining both the necessary and sufficient conditions for the convergence hypothesis even though Aslan and Kula (2011) examines the necessary condition. The LM unit root testing framework developed by Lee and Strazicich (2003) is based on the assumption that the structural breaks are sharp, implying the sudden breaks in income levels. This assumption also requires a priori information about the number (one or two) of structural breaks in the series. However, it may not be possible to know the true form and number of breaks in a series and thereby this strict assumption may not be hold in practice. Recent studies on unit root testing procedures –inter alia Becker et al. (2006), Enders and Lee (2012a, 2012b), Rodrigues and Taylor (2012)- argue that economic series may contain multiple smooth breaks at unknown dates and propose to test the null hypothesis of unit root that allows gradual structural shifts using a Fourier approximation. Our study benefits from the recent developments in time series unit root literature and not only employs the conventional unit root testing strategies but also estimates different model specifications which includes the different type (sharp, smooth) of structural breaks. Finally, although our results support those of Aslan and Kula (2011) when we estimate the model with sharp breaks and show the convergence among Turkish provinces, we find out the evidence on the divergence among the provinces when the breaks are modelled as a gradual process.

Table 2: Literature Review for Turkey

Author	Period	Data	Method	Result
Filiztekin (1998)	1975-1990	65 provinces	CS and PD	Convergence
Tansel and Güngör (1998)	1975-1990	67 provinces	CS and PD	Convergence
Erk et al. (2000)	1979-1997	67 provinces	CS	Divergence
Berber et. al (2000)	1975-1997	7 region	CS and PD	Divergence
Doğruel and Doğruel (2003)	1987-1999	67 provinces	CS	Convergence
Gezici and Hewings (2004)	1980-1997	67 provinces	CS	Divergence
Karaca (2004)	1975-2000	67 provinces	CS	Divergence
Kılıçaslan and Özatağan (2007)	1987-2000	64 provinces	PD	Convergence
Yamanoğlu (2008)	1990-2001	67 provinces	CS	Convergence
Karaalp and Erdal (2009)	1990-2001	73 provinces	CS	Convergence
Zeren and Yılancı (2011)	1991-2000	25 region	PD	Convergence
Aslan and Kula (2011)	1975-2001	67 provinces	TUR & PUR	Convergence
Erlat (2012)	1975-2001	65 provinces	PUR	Divergence
Abdioğlu and Uysal (2013)	2004-2008	26 region	PUR	Divergence

CS: Cross-section regression model, PD: Panel data regression model; TUR: Time series unit root test; PUR: Panel unit root test.

This study employs the real per capita income data of 73 provinces from 1992 to 2013. Due to the fact that there is a shift in the income level of Turkish provinces over the past decades, an attempt is paid to what extent controlling for structural shifts plays a role in deciding whether income converges or diverges. In that respect, we start with the estimating the no-shift model that does not include any structural changes and then proceed to its extensions which account for structural shifts. We first assume that structural changes are sharp, implying the sudden breaks in income levels. At a glance; while the no-shift model supports the income divergence for 61 provinces, the sharp-shift model provides an evidence on the income convergence in more of the provinces. This finding reveals a crucial role of controlling for structural changes to determine the convergence or divergence. We then question to what extent modelling structural shifts as a gradual/smooth process leads to changes in inferences. The smooth-shift model shows the income divergence for 52 provinces. The empirical analysis thereby implies the important role of how to capture structural breaks because assuming sharp or gradual process considerably changes the inferences and the implications. The results overall provide an evidence on the income divergence between the east and west of Turkey. We finally discuss the causes of the regional income disparities and furthermore try linking it to the urbanization disparities.

The study is organized as follows. Section 2 provides a brief theoretical background on the income convergence and discusses the modelling issues. Section 3 outlines the empirical methodology and describes the data. Section 4 is devoted to the empirical findings followed by the discussion in section 5. Section 6 finally summarizes and concludes the paper.

2. Background and Modelling Issues

Since the seminal paper of Solow (1956) many research has been devoted to the question of whether poorer economies catch up wealthier ones. This phenomenon is known as "convergence" and defined in two different ways: unconditional and conditional convergence. The former predicts that economies with lower per capita income will grow faster than economies with higher per capita income. Thus, per capita incomes of all countries converge to a common steady state level of income in the long-run regardless of their initial conditions. The latter support the idea that a country's per capita income converges to its own long-run level and only per capita incomes of the countries with the identical structural characteristics (e.g. preferences, technology, saving rates, etc.) converge to each other in the long-run (see Barro and Sala-i Martin, 1991, 1992, 1995).

In the empirics of the convergence analysis, the early studies estimated a cross-section regression model. Although there is no evidence for unconditional convergence among a large sample of countries, the conditional convergence hypothesis holds for economies that exhibit similar characteristics (among others, Baumol, 1986; Barro, 1991; Mankiw et al. 1992).[2] The cross-sectional model has been criticized particularly because of misleading inferences because it does not allow analyzing dynamic behavior of the data (Quah, 1993).[3] Evans (1996) also demonstrates that cross-country regressions have highly implausible assumptions which can never be satisfied by the real data.[4]

The more recent studies therefore propose different methodological concepts. Some studies have extended the cross-sectional testing framework by taking into account (i) spatial effects (Rey and Montouri, 1999; Battisti and Di Vaio, 2008; Pfaffermayr, 2009; Arbia et al., 2010 and (ii) semiparametric (Dobson et al. 2003; Azomahou et al., 2011) and nonparametric specifications (Li et al., 2016). Some other studies alternatively have embedded cross-section concepts in a panel data framework (Islam, 1995; Caselli et al. 1996) which show that the rate of convergence is larger than the conditional convergence of cross-sectional empirical works.

Either cross-section or panel data modelling assumes that the rates of convergence are equal across the individuals. Since time series modelling allows the rate of convergence to differ, they are widely employed in the convergence analysis. In time series modelling framework, the long-run behavior of per capita income deviations from the sample average is examined by focusing on whether the per capita income has a long-run steady state equilibrium. Campbell and Mankiw (1989) and Bernard and Durlauf (1995) define the convergence as a co-integration relation and show that there is a little evidence in favor of convergence among OECD countries.

Alternative to the co-integration analysis, Carlino and Mills (1993) benefit from the unit root framework which supports an evidence for the income convergence if the relative per capita income is found to be stationary. By adopting conventional ADF test allowing a break in time trend, authors find a support for the convergence in the U.S. regions. Chong et al. (2008) test income convergence by employing the nonlinear unit root test of Kapetanios et al. (2003) for 15 OECD countries and detect convergence for only four countries. By switching Chong et al. (2008) non-linear modelling framework for sharp shift break analysis, King and Dobson (2011) consider the possibility of one or two sharp break(s) in time trend based on the LM unit root test by Lee and Strazicich (2003) and provide more evidence for the convergence among OECD countries. King and Dobson (2014) further question whether modelling structural break as a gradual process instead of a sharp one by using Fourier-type unit root tests proposed by Enders and Lee (2012b). They find that half of the 24 OECD countries are systematically catching-up with the U.S.

The literature on the time series framework indicates not only the importance of accounting for structural shifts but also a crucial role of how to model structural breaks. This study hence benefits from the recent developments in the time series analysis and re-examine the income convergence in Turkey at a provinces level in order to better understand the dynamics of the per capita income levels.

3. Methodology and Data

In this study, we benefit from the time series methodology suggested by Carlino and Mills (1993). The econometric model is written as

$$y_{it} = \mu_i + \beta_i t + u_{it} \qquad (1)$$

where y_{it} denotes the natural logarithm of relative per capita income for province i at time t, β represents the deterministic rate of convergence over t, μ represents the initial level of y_{it} and u_{it} is the error term which has assumed to be independently and identically distributed with zero mean and finite variance (for ease in exposition, the region i subscript is suppressed). The convergence hypothesis –also called as β-convergence- requires that if a province is above its compensating differential initially, i.e., $\mu > 0$, it should grow more slowly than the nation, i.e., $\beta < 0$. On the other hand, if the initial value of a province is under its compensating differential ($\mu < 0$), then $\beta > 0$. Inference on the estimates of μ and β is complicated if ε_t contains a unit root process (Tomljanovich and Vogelsang, 2002). Carlino and Mills (1993) therefore argue that two conditions are required for convergence. First, shocks to y_t should be temporary (stochastic convergence) and second, initially poor provinces should catch up rich provinces (β-convergence). The stochastic convergence in the time series modelling framework implies that y_t follows a stationary process. In order to test for stationarity of y_t, following Carlino and Mills (1993) we first start with the Dickey-Fuller (DF) test developed by Dickey and Fuller (1979) and estimate the no-shift regression model as

$$\Delta y_t = Z_t'\delta + \alpha y_{t-1} + \varepsilon_t \qquad (2)$$

where Δy_t is the first difference of y_t, Z_t, includes the deterministic terms defined by $[1, t]$ and ε_t is the error term. The null hypothesis of unit root $(H_0: \alpha = 0)$ is tested against the alternative hypothesis of stationarity $(H_1: \alpha < 0)$. Accordingly, if the null hypothesis is rejected, then an evidence is supported in favor of stochastic convergence. The test statistic denoted by τ is defined by the t-ratio of α. Under the null hypothesis, the t-ratio corresponds to y_{t-1} does not follow the asymptotic t-distribution and therefore one needs to use the critical values provided by Dickey and Fuller (1979).

In the no-shift model, Z_t is assumed not to have any structural changes. However, ignoring structural shifts leads to misleading inferences because of incorrectly retaining a false unit root null hypothesis (Perron, 1989). In order to handle this problem, Zivot and Andrews (1992) allow a sudden structural break in the DF test. To formulize the sharp-shift model with one break, Z_t is described as $[1, t, DU_{1t}, DT_{1t}]$ where $DU_{1t} = 0 \text{ for } t \leqslant T_B$ for and 1 otherwise and $DT_{1t} = 0 \text{ for } t \leqslant T_B$ and $t - T_B$ otherwise that T_B denotes the break date. Narayan and Popp (2010) extend Zivot and Andrews (1992)'s sharp shift model for two sudden breaks that Z_t becomes, $[1, t, DU_{1t}, DT_{1t}, DU_{2t}, DT_{2t}]$ where $DU_{it} = 0 \text{ for } t \leqslant T_{Bi}$ and 1 otherwise and $DT_{it} = 0 \text{ for } t \leqslant T_{Bi}$ and $t - T_{Bi}$ otherwise and T_{Bi} $(i = 1,2)$ shows the break dates. The statistic for testing the null hypothesis of unit root with structural shifts is described as in the DF test. Both Zivot and Adrews (1992) and Narayan and Popp (2010) approaches use the dummy variables to capture sudden structural changes and require estimating the break dates. The location of break (T_{Bi}) is endogenously determined to be where the test statistic is minimized (i.e., the most negative) by a grid search procedure by considering all possible break points as $\hat{\delta} = \inf\tau(\delta)$ where $\delta = T_{Bi}/T$ and $\delta \in [0,1]$. Finally, τ statistic with structural shifts does not follow the asymptotic t-distribution and hence the simulated critical values are used.

It is worthwhile noting that the sharp-shift models entail knowing *a priori* the number, dates and form of breaks. In practice, it is however difficult to have such a priori knowledge and moreover economic series may contain multiple smooth breaks at unknown dates. More recently, Enders and Lee (2012b) propose the smooth-shift model type of the DF unit root test by using a Fourier approximation for Z_t which does not require selecting the dates, number, and form of the breaks. The Fourier expansion for Z_t is described as $\left[1, t, \sin(\frac{2\pi kt}{T}), \cos(\frac{2\pi kt}{T})\right]$ where k represents an integer frequency. The test statistic is again described as in the DF test, but its distribution now depends on k that requires using the critical values for different values of the Fourier frequency (see, Enders and Lee, 2012b).

We employ the annual real GDP per capita for 73 Turkish provinces from 1992-2013. The data was taken from The Economic Policy Research Foundation of Turkey (TEPAV). Although Turkish Statistical Institute (TSI) has not disclosed GDP data at the provincial level since 2001, TEPAV calculated provincial GDP data by using "night lights data" which is a reliable and powerful source of data for measurement of economic size.[5] We took population data from TSI to calculate the per capita GDP. The relative provincial per capita income is defined as $y_t = ln(y_{i,t}/\overline{y_t})$ where $y_{i,t}$ is the per capita income for the province i and $\overline{y_t}$ is the average per capita income for all 73 provinces.

4. Empirical Findings

Before proceed to discussing the empirical findings, it is worthwhile noting here that the error term ε_t in the equation (2) may not meet the i.i.d. assumption and may have a serial correlation problem. To correct for serial correlation, the equation (2) is augmented with the lagged values of the dependent variable Δy_{t-j}, $j = 1, \dots, p$ that this procedure is called as the augmented DF (ADF) approach. In determining (the optimal number of lags), we follow the general-to-specific procedure described by Perron (1989) and Ng and Perron (1995). Specifically, the procedure starts with a maximum of and looks for the significance of the last augmented term. Then the optimal number of lags is determined with the significance of the t-statistic of the last lagged term by using the 10 percent significance level.

The results from the no-shift ADF model are reported in Table 3. The null hypothesis of unit root is rejected for only twelve provinces. It accordingly supports a strong evidence on the divergence of per capita income among Turkish provinces. Turkey experienced two major economic crises (the 1994 and 2001 currency and banking crises). She also was affected with the external shocks by the 1998 Asian & Russian crisis and the 2008 global financial turbulence. The inferences from the no-shift model thereby might be misleading because of ignoring structural breaks which may occur from the shocks.

To account for structural shifts, we first consider the unit root methods which control the breaks as a sharp process by Zivot and Andrews (1992) and Narayan and Popp (2010). Note that we follow Lee and Strazicich (2003) approach in order to determine the break dates and the number of optimal lags. We set to the maximum number of lags to 4 and first determine the optimal lag for each of possible break points by the significance of t-stat of the last lagged term at the 10 percent. Then the procedure searches for the optimal break points to be where the unit root test statistic is minimized. This selection method hence allows for examining all combination of the break points.

The results from the sharp-shift models are presented in Table 4. The one break model of Zivot and Andrews (1992) indicates that the null hypothesis of unit root is rejected for forty-five provinces. This finding implies that the per capita income converges to the national average for the majority of Turkish provinces. In the remaining twenty-eight provinces the null of unit root cannot be rejected at least 10 percent level of significance, indicating that the per capita income in these provinces is not mean reverting and hence diverges from the national average. The breaks are found in 1998 for twenty-five provinces and in 2005 for twenty-two provinces. Hence the one-break sharp-shift model seems to capture the 1998 Asian & Russian economic crisis on the one hand and the calculation method change of Turkish national income in 2005 on the other hand for more than half of 73 provinces. The break dates for the remaining twenty-six provinces do not appear to gather around a specific event.

When we estimate the sharp-shift model with two breaks, there is a substantial change with respect to the nature of shocks to the Turkish per-capita income. The Narayan and Popp (2010) sharp-shift model with two structural breaks shows that the null of unit root is rejected for sixty-four provinces. This finding is interpreted as a strong evidence in favor of the income convergence for almost of all provinces. The first and second breaks are respectively found to be in 1998 and in 2005 for the majority of provinces. While the first break seems to arise from the 1998 Asian & Russian economic crisis, the second break appears to correspond to the calculation method change of Turkish national income in 2005.

Table 3: Results from the No-shift Model

Marmara			Aegean			Mediterranean			Southeastern Anatolia		
İstanbul	-2.294		İzmir	-3.017		Antalya	-2.351		Gaziantep	-2.123	
Tekirdağ	-2.422		Aydın	3.098		Isparta	-2.273		Adıyaman	-1.078	
Edirne	-2.461		Denizli	-0.973		Burdur	-3.102		Şanlıurfa	-2.594	
Kırklareli	-1.985		Muğla	-2.213		Adana	-3.354	*	Diyarbakır	-1.706	
Balıkesir	-3.307	*	Manisa	-2.935		Mersin	-2.105		Mardin	-1.878	
Çanakkale	-2.624		Afyon	-3.852	**	Hatay	-3.969	**	Batman	-2.557	
Bursa	-3.636	**	Kütahya	-3.883	**	Maraş	-3.299	*	Şırnak	-3.223	*
Bilecik	0.089		Uşak	-2.366					Siirt	-1.660	
Kocaeli	-2.017										
Sakarya	-2.310										
Black Sea			Central Anatolia			Eastern Anatolia					
Bolu	-4.323	***	Eskişehir	-0.870		Erzurum	-1.867				
Zonguldak	-2.850		Ankara	-2.188		Erzincan	-2.441				
Kastamonu	-1.509		Konya	-1.117		Bayburt	-3.047				
Sinop	-2.346		Karaman	-0.512		Ağrı	-2.986				
Samsun	-1.337		Kırıkkale	-2.007		Kars	-2.072				
Tokat	-2.034		Aksaray	-1.850		Malatya	-1.299				
Çorum	-2.030		Niğde	0.137		Elazığ	-2.706				
Amasya	-3.380	*	Nevşehir	0.357		Bingöl	-0.728				
Trabzon	-1.356		Kırşehir	-2.622		Tunceli	-1.537				
Ordu	-2.893		Kayseri	-3.139		Van	-3.382	*			
Giresun	-3.164		Sivas	-3.021		Muş	-2.619				
Rize	-2.767		Yozgat	-1.699		Bitlis	-1.365				
Artvin	-2.081		Çankırı	-2.370		Hakkâri	-3.684	**			
Gümüşhane	-2.094										

***, **, and * denote statistically significance at the 1%, 5% and 10% levels, respectively.
No-shift model: $\Delta y_t = \mu + \beta t + \alpha y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta y_{t-j} + \varepsilon_t$. The critical values are -4.15 (1%), -3.50 (5%), -3.18 (10%).

Table 4: Results from the Sharp-shift Models

Provinces	ZA		T_B	NP		T_{B1}	T_{B2}
Marmara							
İstanbul	-5.137	**	2004	-14.250	***	1998	2005
Tekirdağ	-4.128		1998	-6.978	***	1998	2005
Edirne	-5.959	***	1998	-8.080	***	1998	2006
Kırklareli	-5.502	**	1998	-7.757	***	1998	2006
Balıkesir	-3.702		2009	-3.903		2000	2005
Çanakkale	-5.479	**	1998	-5.110	*	1998	2005
Bursa	-4.017		2005	-10.840	***	1998	2005
Bilecik	-7.479	***	2008	-7.313	***	1998	2005
Kocaeli	-6.654	***	2004	-21.054	***	1998	2005
Sakarya	-8.080	***	2005	-9.167	***	1998	2005
Central Anatolia							
Eskişehir	-4.135		1999	-6.755	***	2001	2004
Ankara	-5.523	**	2005	-10.558	***	2000	2004
Konya	-4.330		2003	-3.667		1998	2003
Karaman	-3.963		2006	-6.407	***	1998	2005
Kırıkkale	-7.924	***	2005	-8.418	***	2000	2005
Aksaray	-4.812		1998	-9.567	***	1998	2005
Niğde	-3.916		2006	-4.423		2000	2006
Nevşehir	-7.568	***	2000	-8.160	***	2000	2006
Kırşehir	-5.003	*	1998	-8.639	***	1998	2005
Kayseri	-4.770		2005	-6.269	***	2000	2005
Sivas	-4.603		2002	-12.738	***	1998	2005
Yozgat	-11.881	***	2005	-13.548	***	1998	2005
Çankırı	-5.714	***	2005	-6.769	***	1998	2005
Black Sea							
Bolu	-5.072	*	1998	-4.808	*	1998	2004
Zonguldak	-4.556		1998	-5.583	**	1998	2006
Kastamonu	-18.102	***	1998	-13.731	***	1998	2001
Sinop	-11.658	***	1998	-17.856	***	1998	2005
Samsun	-5.690	***	1998	-4.208		2000	2006
Tokat	-10.493	***	2005	-14.247	***	1998	2005
Çorum	-7.415	***	1998	-8.198	***	1998	2005
Amasya	-6.149	***	1998	-7.681	***	1998	2005
Trabzon	-6.728	***	2005	-14.144	***	1998	2005
Ordu	-5.258	**	2004	-6.559	***	2000	2005
Giresun	-7.482	***	2005	-14.396	***	1998	2005
Rize	-4.600		2004	-7.523	***	1998	2005
Artvin	-7.522	***	1998	-13.983	***	1998	2005
Gümüşhane	-10.402	***	2005	-10.445	***	1998	2005
Mediterranean							
Antalya	-25.057	***	1998	-19.830	***	1998	2005
Isparta	-2.920		1998	-6.935	***	1998	2005
Burdur	-4.205		1998	-9.902	***	1998	2006
Adana	-3.576		2008	-5.571	**	1998	2005
Mersin	-7.882	***	1998	-5.567	**	1998	2006
Hatay	-4.769		2005	-5.683	**	1998	2005
Maraş	-4.357		2010	-3.619		2003	2006

Provinces	ZA		T_B	NP		T_{B1}	T_{B2}
Aegean							
İzmir	-5.133	**	2010	-9.138	***	1998	2005
Aydın	-2.412		2006	-4.521		2000	2006
Denizli	-8.427	***	2005	-9.183	***	1998	2005
Muğla	-3.021		2005	-5.031	*	1998	2005
Manisa	-5.233	**	2004	-4.506		2001	2004
Afyon	-4.843	*	2004	-4.102		1999	2004
Kütahya	-3.418		2005	-6.149	***	1998	2005
Uşak	-3.262		2000	-9.514	***	2000	2005
Eastern Anatolia							
Erzurum	-6.521	***	2005	-10.793	***	1998	2005
Erzincan	-12.929	***	2005	-16.725	***	2000	2005
Bayburt	-6.423	***	1998	-12.356	***	1998	2005
Ağrı	-4.946	*	2002	-5.667	**	1998	2002
Kars	-10.192	***	1998	-13.625	***	1998	2006
Malatya	-6.067	***	2005	-10.804	***	1998	2005
Elazığ	-4.237		2006	-6.299	***	2000	2006
Bingöl	-7.568	***	1998	-8.213	***	1998	2006
Tunceli	-8.948	***	1998	-9.674	***	1998	2005
Van	-4.940	*	1998	-8.967	***	1998	2005
Muş	-7.880	***	2005	-7.542	***	2002	2005
Bitlis	-4.703		2005	-9.256	***	1998	2005
Hakkâri	-5.004	*	2002	-6.312	***	1998	2006
Southeastern Anatolia							
Gaziantep	-6.618	***	2005	-18.570	***	1998	2005
Adıyaman	-4.731		1998	-4.982	*	1999	2003
Şanlıurfa	-3.811		1998	-16.129	***	1998	2005
Diyarbakır	-3.890		2004	-4.106		1998	2005
Mardin	-4.966	*	2009	-6.268	***	1998	2005
Batman	-3.231		2002	-5.094	*	1998	2005
Şırnak	-4.810		2008	-10.416	***	1998	2005
Siirt	-8.227	***	2005	-9.208	***	2000	2005

***, **, and * denote statistically significance at the 1%, 5% and 10% levels, respectively.
ZA: Zivot and Andrews (1992). NP: Narayan and Popp (2010).
One-break sharp shift (ZA) model is $\Delta y_t = \mu + \beta t + \mu_1 DU_{1t} + \beta_1 DT_{1t} + \alpha y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta y_{t-j} + \varepsilon_t$.
The critical values are -5.57 (1%), -5.08 (5%), -4.82 (10%) (see Table 4 in Zivot and Adrews, 1992, pp.257).
Two-breaks sharp shifts (NP) model is $\Delta y_t = \mu + \beta t + \mu_1 DU_{1t} + \beta_1 DT_{1t} + \mu_2 DU_{2t} + \beta_2 DT_{2t} + \alpha y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta y_{t-j} + \varepsilon_t$.
The critical values are -5.57 (1%), -5.08 (5%), -4.82 (10%) (See Table 3 in Narayan and Popp, 2010, pp. 257).

The results so far imply that the relative per capita income diverges if one assumes no structural change and it -in contrast with this finding- tends to converge if one takes into account the structural shifts. The little (more) evidence on the income convergence by ignoring (considering) structural changes is consistent with the literature which conducts the time series analysis (among others, Li and Papell, 1999; Strazicich et al. 2004; and King and Dobson, 2011). In the sharp-shift models, the trend is assumed not to be strictly linear and it is composed to a pre-specified number of discrete linear segments. Moreover, there may be a discontinuity at the breakpoint because the end and start of linear segments do not need to be concur. Last but not least, the sharp shift assumption requires an immediate transition from one segment to another. All these limitations arise the caution is that whether the relative growth path of a province contains such properties. An arguably more realistic approach is to accommodate structural changes in the income series as smooth/gradual process (King and Dobson, 2014).

To account for structural shifts as gradual process, we estimate the smooth-shift model proposed by Enders and Lee (2012b). The testing procedure now requires determining the Fourier frequency and the number of lags. Following Enders and Lee (2012b), we apply the general-to-specific approach. The maximum number of Fourier frequency is set to 3 and the maximum number of lags is set to 4. We first determine the optimal lag for each of frequency with the significance of the last lagged term by looking at its t-statistic at the 10 percent level. The optimal number of Fourier frequency component is then selected by the minimization of sum of squared residuals of the regression model.

The results from the smooth-shift model are shown in Table 5. The null of unit root is rejected for twenty-one provinces. The finding supports an evidence in favor of the per capita income divergence of Turkish provinces. The smooth-shift model also provides that the least converging regions are located in the east and north of Turkey. The null of unit root is rejected for 4 provinces in Marmara Region, in other words GDP per capita of 40% of provinces in Marmara Region are converging to the national average. The ratio for the other regions is as follows: 37.5% for Aegean, 30.7% for Central Anatolia, 28.5% for Mediterranean, 25% for Southern Anatolia, 23% for Eastern Anatolia and 21.4% for Black Sea.

Table 5: Results from the Smooth-shift Model

Provinces	$\hat{k}$	t-ratio	Provinces	$\hat{k}$	t-ratio	Provinces	$\hat{k}$	t-ratio
Marmara			Aegean			Mediterranean		
İstanbul	1	-3.198	İzmir	3	-4.008 ***	Antalya	3	-2.468
Tekirdağ	1	-3.550	Aydın	1	-5.845	Isparta	1	-3.688 *
Edirne	1	-3.410	Denizli	1	-1.464	Burdur	2	-3.765 ***
Kırklareli	1	-3.033 ***	Muğla	3	-3.300	Adana	3	-4.976
Balıkesir	1	-4.974	Manisa	1	-3.169	Mersin	1	-1.370
Çanakkale	2	-2.217 **	Afyon	2	-3.582 **	Hatay	3	-3.418
Bursa	3	-3.939 ***	Kütahya	1	-4.574	Maraş	1	-2.435
Bilecik	1	-5.388	Uşak	1	-3.326 **			
Kocaeli	1	-3.934						
Sakarya	1	-3.884 *						
Black Sea			Central Anatolia			Eastern Anatolia		
Bolu	2	-3.952 **	Eskişehir	1	-5.526 ***	Erzurum	1	-3.540
Zonguldak	1	-3.082	Ankara	1	-4.943	Erzincan	3	-2.618 ***
Kastamonu	1	-2.679	Konya	1	-1.908	Bayburt	3	-4.509 *
Sinop	3	-2.438	Karaman	1	-3.066	Ağrı	1	-4.130
Samsun	1	-3.188	Kırıkkale	1	-2.532	Kars	2	-2.441
Tokat	2	-2.235	Aksaray	1	-3.656	Malatya	1	-3.244
Çorum	1	-4.034 **	Niğde	1	-3.230 **	Elazığ	3	-2.371
Amasya	3	-4.285	Nevşehir	1	-4.458	Bingöl	1	-2.724
Trabzon	1	-2.706	Kırşehir	2	-3.448 *	Tunceli	1	-3.201
Ordu	1	-3.392 **	Kayseri	3	-3.508 *	Van	1	-4.019
Giresun	3	-4.010	Sivas	1	-4.302	Muş	2	-3.449
Rize	1	-3.755	Yozgat	1	-2.386	Bitlis	1	-3.810 **

Artvin	1	-3.993	Çankırı	1	-3.204	Hakkâri	2	-4.513
Gümüşhane	2	-2.439						
Southeastern Anatolia								
Gaziantep	1	-3.400 **						
Adıyaman	1	-4.480						
Şanlıurfa	3	-2.880						
Diyarbakır	1	-2.716						
Mardin	3	-1.666						
Batman	2	-2.172 **						
Şırnak	3	-3.985						
Siirt	1	-3.243						

***, **, and * denote statistically significance at the 1%, 5% and 10% levels, respectively. Trimming is 0.12 for the sharp structural break tests.Gradual structural shift model is $\Delta y_t = \mu + \beta t + \theta sin\left(\frac{2\pi kt}{T}\right) + \varphi \cos\left(\frac{2\pi kt}{T}\right) + \alpha y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta y_{t-j} + \varepsilon_t$. The critical values are -4.95 (1%), -4.35 (5%), -4.05 (10%) for $k = 1$; -4.69 (1%), -4.05 (5%), -3.71 (10%) for $k = 2$; and -4.45 (1%), -3.78 (5%), -3.44 (10%) for $k = 3$ (see Table 1a in Enders and Lee, 2012b, pp. 197.

As discussed earlier, stationarity of y_t –i.e., defined as the stochastic convergence– is a necessary but not sufficient condition for convergence (Carlino and Mills, 1993) since convergence also requires that a province with a per-capita income below the national average must grow more than the national growth rate –i.e., defined as β —convergence- (Cunado and Perez de Gracia, 2006). In order to test for the validity of β— convergence, following Tomljanovich and Vogelsang (2002) we estimate the equation (1) for each province in which the stochastic convergence is supported based on the smooth shift-model. The results from the estimation of the equation (1) are summarized in Table 6. It is worthwhile to re-state that β- convergence is supported if $\mu > 0$ then $\beta < 0$ and if $\mu < 0$ then $\beta > 0$. The findings indicate that the negative relationship between μ and β are supported only for fifteen provinces. In five provinces (Kırklareli, Çanakkale, Bursa, İzmir, and Gaziantep), we find evidence on $\mu > 0$ then $\beta < 0$ which implies that these five provinces grow more slowly than the nation. On the other hand, $\mu < 0$ then $\beta > 0$ for ten provinces which grow faster than the nation. An interesting finding is that the five provinces are located in the western side of Turkey although the most of ten provinces are placed in the eastern Turkey.

Table 6: Results from -convergence Estimations

Region	Province	μ	$t-stat$		β	$t-stat$		Decision
Marmara	İstanbul	0.928	24.791	***	-0.035	-12.392	***	D
	Tekirdağ	0.868	38.296	***	-0.029	-16.912	***	D
	Edirne	-0.005	-0.167		0.008	3.526	***	D
	Kırklareli	0.645	30.654	***	-0.003	-1.734	*	C
	Balıkesir	0.200	14.836	***	-0.006	-6.135	***	D
	Çanakkale	0.439	29.109	***	-0.012	-10.512	***	C
	Bursa	0.776	37.640	***	-0.019	-12.183	***	C
	Bilecik	0.803	57.719	***	-0.004	-3.738	***	D
	Kocaeli	1.473	49.329	***	-0.028	-12.223	***	D
	Sakarya	0.189	14.705	***	0.001	0.526		D
Aegean	İzmir	0.808	54.288	***	-0.012	-10.452	***	C
	Aydın	0.279	18.632	***	-0.001	-0.735		D
	Denizli	0.551	29.854	***	-0.005	-3.214	***	D
	Muğla	0.742	49.914	***	-0.015	-12.920	***	D
	Manisa	0.569	26.030	***	0.003	1.929	*	D
	Afyon	-0.345	-9.367	***	0.009	3.271	***	C
	Kütahya	-0.021	-0.728		0.010	4.597	***	D
	Uşak	-0.226	-15.999	***	0.008	7.314	***	C
Mediterranean	Antalya	0.721	23.636	***	-0.029	-12.630	***	D

	Isparta	-0.229	-8.189	***	0.018	8.337	***	C
	Burdur	0.006	0.471		0.009	8.728	***	D
	Adana	0.168	10.447	***	-0.007	-5.588	***	D
	Mersin	0.507	18.763	***	-0.008	-4.011	***	D
	Hatay	0.063	2.824	***	0.005	2.757	***	D
	Maraş	-0.056	-2.855	***	-0.009	-5.724	***	D
Central Anatolia	Eskişehir	0.459	20.307	***	-0.002	-1.096		D
	Ankara	0.554	21.240	***	-0.007	-3.330	***	D
	Konya	-0.133	-5.094	***	-0.002	-0.915		D
	Karaman	0.158	12.507	***	0.000	0.387		D
	Kırıkkale	-0.016	-0.413		0.025	8.397	***	D
	Aksaray	-0.543	-34.372	***	-0.002	-1.787	*	D
	Niğde	-0.048	-3.416	***	0.008	7.106	***	C
	Nevşehir	-0.002	-0.073		0.025	11.726	***	D
	Kırşehir	-0.412	-21.438	***	0.018	11.968	***	C
	Kayseri	-0.030	-1.801	*	0.001	0.471		D
	Sivas	-0.559	-24.184	***	0.019	10.588	***	D
	Yozgat	-0.714	-18.657	***	0.013	4.411	***	D
	Çankırı	-0.787	-16.202	***	0.034	9.099	***	D
Black Sea	Bolu	0.020	1.513		-0.010	-10.225	***	D
	Zonguldak	-0.644	-24.996	***	0.026	13.279	***	D
	Kastamonu	-0.306	-7.738	***	0.017	5.651	***	D
	Sinop	-0.638	-19.290	***	0.029	11.326	***	D
	Samsun	-0.140	-5.707	***	0.011	5.805	***	D
	Tokat	-0.515	-17.085	***	0.023	10.173	***	D
	Çorum	-0.216	-10.555	***	0.014	9.158	***	C
	Amasya	-0.432	-30.382	***	0.016	14.621	***	D
	Trabzon	-0.259	-6.275	***	0.014	4.470	***	D
	Ordu	-0.549	-30.493	***	0.024	17.476	***	C
	Giresun	-0.363	-14.809	***	0.016	8.522	***	D
	Rize	-0.107	-7.062	***	0.013	11.501	***	D
	Artvin	-0.234	-7.322	***	0.028	11.359	***	D
	Gümüşhane	-0.876	-23.231	***	0.026	8.901	***	D
Eastern Anatolia	Erzurum	-0.781	-34.655	***	0.009	5.466	***	D
	Erzincan	-0.804	-21.412	***	0.028	9.955	***	C
	Bayburt	-1.179	-44.987	***	0.034	17.103	***	C
	Ağrı	-1.287	-59.662	***	-0.007	-4.236	***	D
	Kars	-1.669	-59.830	***	0.011	5.135	***	D
	Malatya	-0.158	-5.778	***	0.005	2.326	**	D
	Elazığ	-0.276	-26.763	***	0.006	7.675	***	D
	Bingöl	-1.097	-35.661	***	0.004	1.557		D
	Tunceli	-1.327	-22.529	***	0.045	10.067	***	D
	Van	-0.614	-18.578	***	-0.023	-9.078	***	D
	Muş	-1.189	-93.749	***	-0.005	-5.109	***	D
	Bitlis	-1.170	-43.578	***	0.004	2.002	*	C
	Hakkâri	-1.039	-57.750	***	-0.023	-16.727	***	D
South Eastern Anatolia	Gaziantep	0.066	2.724	**	-0.014	-7.431	***	C
	Adıyaman	-0.361	-11.019	***	-0.010	-3.978	***	D
	Şanlıurfa	-0.125	-4.689	***	-0.021	-10.108	***	D
	Diyarbakır	-0.405	-10.288	***	-0.001	-0.425		D
	Mardin	-0.355	-21.495	***	-0.009	-7.119	***	D
	Batman	-0.484	-15.484	***	-0.003	-1.057		D
	Şırnak	-0.904	-29.354	***	-0.027	-11.597	***	D
	Siirt	-0.372	-12.457	***	-0.013	-5.876	***	D

D: Divergence. C: Stochastic and -convergence

5. Discussion

The standard neoclassical growth theory supports the view that per capita incomes of all countries converge to a common steady state level in the long-run regardless of their initial conditions. However, the conditional convergence hypothesis suggests the idea that only per capita incomes of the countries with the *identical structural characteristics* (e.g. preferences, technology, saving rates, etc.) converge to each other in the long-run. (Barro and Sala-i Martin, 1991, 1992, 1995). In fact, the long-term behaviour of per capita income among countries or regions is a result of a set of interrelated factors. In that sense, investment has a crucial role in growth process for both neoclassical and new growth models. It therefore appears to be necessary to focus on the regional conditions - particularly the investability situation- when discussing the results from the convergence analysis for policy implications.

Before proceeding with discussing the investability situation of Turkish regions, it would be insightful to look at some stylized facts. In this respect, mapping the developments in per capita income at the provincial level may be a guide for interpreting the results. Figure 2 maps the dispersion of 73 provincial income of Turkey for 1992, 2002 and 2013. In these maps, per capita income is divided into five income quantiles. The darker the colors, the lower the income quantile and thus the highest income is demonstrated in the lightest color which means that the income is above $10,000. The provinces in the Marmara region, the coastal provinces of the Aegean and the Mediterranean regions, and the provinces around the capital city Ankara in the Central Anatolian region are located in the higher income quantile. Even though the income has increased over the years, the income differentials between the eastern and the western regions is not closed. While there was only one city in the highest income quantile in 1992, this number increased to fifteen in 2013. The per capita income in all Eastern Anatolia, Southeastern Anatolia, and Black Sea regions (except Artvin, Rize, and Trabzon) is below $8,000. Moreover, the least income quantile regions are located in the eastern and northern Turkey. When we combine these stylized facts and the empirical findings together, the smooth shift-model seems to provide the consistent results with the provincial income behavior of Turkey.

The important question here is that why there is an income differences and the divergence between the eastern and northern regions. It is possible to focus on three main reasons. First of them is *terrorist incidents*. Turkey has suffered from terrorism since 1980s and the majority of these terrorist acts take place in the Eastern Anatolia and the Southeastern Anatolia. The empirical studies which examine the economic consequences of terrorism in Turkey suggest that terrorism adversely affect economic growth. The provincial growth effects of terrorism are more pronounced for the eastern and southeastern provinces compared to the western provinces (Öcal and Yildirim, 2010). Furthermore, the eastern and southeastern regions could have enjoyed a much higher level of economic prosperity in the absence of terrorism (Bilgel and Karahasan, 2017).

The second fact is the *geographical conditions*. According to the "new economic geography" models geographical features of regions may constrain economic development due to the less accession to the markets. High transportation costs because of the geographical conditions can hinder industrial production and the market for manufactured goods (Krugman, 1991; Fujita et al., 1999). The Turkish case in fact supports the prediction of the new economic geography models. In the Black Sea region, the mountains are parallel to the shore and this situation would negatively affect logistic networks and hence it is a challenge for investment and trade.

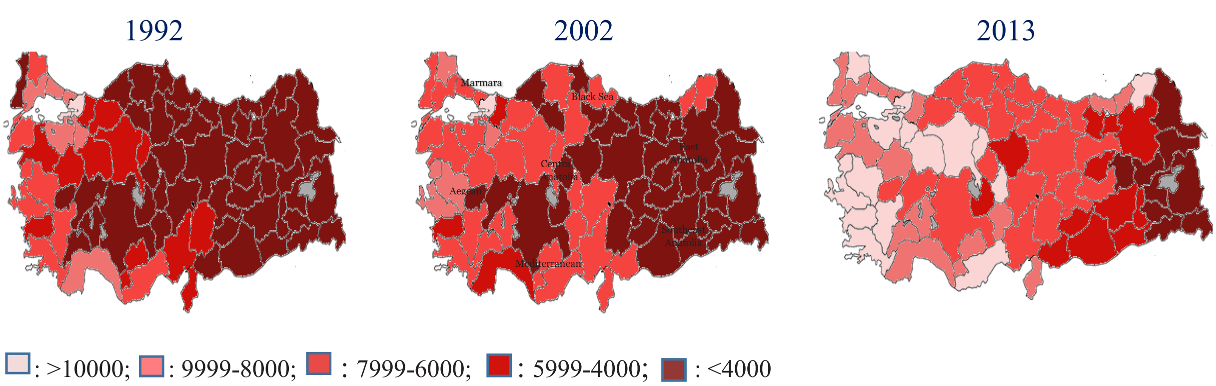
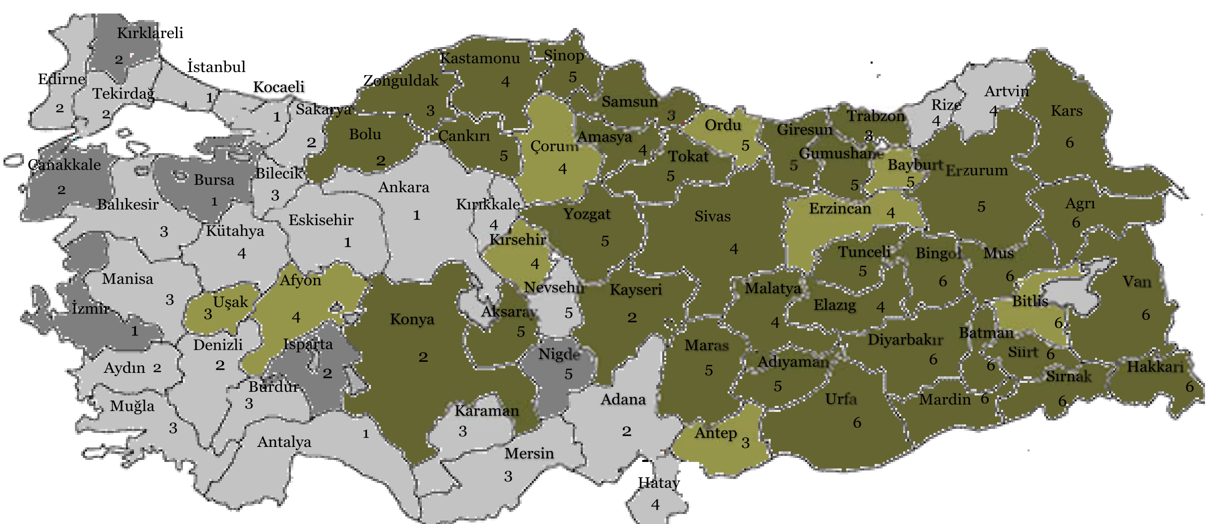


Figure 2: Classification of the Per capita Income in Turkey

Last but not least, the *regional investment policies* can be considered as the cause of income differentials. The incentives for investment has been carried out on the regional basis since 1960s. Sector specific cash incentives to manufacturing and tourism in 1980s not only led to new competitive centers but also increase the urban population in coastal regions. They also triggered to gradually open up the difference between eastern and western regions. Before 1990s, the main aim of the incentives was to increase the investments and exports rather than regional development. At the beginning of the late 1990s and early 2000, incentive measures directly aimed at regional development. The scope of regional incentive policy was very limited because only the provinces with the per capita income lower than $ 1,500 were supported. The ever changing local and international environment have force to shift the scope of Turkish incentive polices. One of the primary objectives of the latest investment scheme -put into effect in 2009- is to increase production and employment through boosting investment support for lesser developed regions. In the new policy, Turkey was classifed into six regions based on the economic development potentials rather than geogrephical borders. Figure 3 maps the regional distribution of the new incentive system by combining the results from the convergence analysis. Note that, the higher the number the more the incentive is provided. At the first glance, the results from the convergence analysis based on the smooth-shift model seem to be consistent with the regional decomposition of the new investment incentive system. Nonetheless, there are few exceptions for this generalization. For example, the smooth-shift model indicates that the income of Konya, Samsun, Trabzon and Zonguldak diverges from the national average whose income are lower than the national average. Thus these provinces should receive higer investment incentives. On the other side, the higher income six provinces (marked with dark grey in the map) converge to the national average. This result can be interpreted as a support of the decline in per capita income of these provinces. Therefore, their positions in the system need a re-consideration.

In theory, economic development and urbanization process mutually reinforce. On the one hand, urbanization fosters economic growth by accompanying institutional progress (Chen, 2002; Liu et al., 2016) and the business –and manufacturing-concentrated urban areas[1] (Chang and Brada, 2006). On the other hand, economic growth promotes the expansion of modern industries and changes the structure of the economy; as a result, populations move from the agriculture-dominated rural areas to industry- and service- dominated urban areas. Turkey's economic development and urbanization process have moved in tandem over the past decades.



: Divergence provinces with GDP per capita < National average

Converging provinces with GDP per capita < National average

: Divergence provinces with GDP per capita > National average

Converging provinces with GDP per capita > National average

Figure 3: The smooth-shift model results and classification of regional investment scheme

[1]The business –and manufacturing- urban-areas lead to the economies of scale and agglomeration economies by lowering transportation costs and promoting knowledge and network spillovers which are the driving factors of economic development.

The key factor which promotes urbanization in Turkey is to benefit from agglomeration economy. Turkey's largest agglomerations –Istanbul, Ankara, and Izmir- which are known as Turkey's primary provinces drove Turkey's economic growth in the twentieth century. Over the last decades, Turkey's urbanization has evolved by the rise of the "Anatolian Tigers" (Denizli, Gaziantep, Kahramanmaraş, Kayseri, Balıkesir and Konya) in which the urbanization grows faster. The empirical results indicate that (i) the Anatolian Tigers that are located in the west of Turkey (Denizli and Balıkesir) have relatively higher per capita income and diverge from the national average; and (ii) the Anatolian Tigers in the central and eastern Anatolia (Konya, Kayseri, Kahramanmaraş) have relatively lower per capita income and diverge from the national average. This interesting finding indicates that although urbanization is one of the key drivers of economic growth, it is not stand-alone for convergence of Turkish provinces. In Turkey, there are still horizontal imbalances dominating economic performance of provinces in the west and the east of Turkey. One of major horizontal imbalances is the level of human capital. In the eastern provinces, deficiency of human capital results in dragging down their competitiveness to produce goods and services. The eastern provinces are also challenged by higher cost barriers to firms as confirmed by business surveys even though Turkey overall has a reasonably-well logistic index indicator (World Bank and TEPAV, 2015: 5). It is therefore to argue that the divergence among the Turkish provinces seems to be driven not only by urbanization but also by structural characteristics and historical imbalances.

6. Conclusion

We examine the income convergence phenomenon in Turkey by collecting the per capita income for 73 provinces during the period 1992-2013. The empirical analysis is based on the unit root framework and benefits from the recent developments in time series testing procedures by paying attention to controlling for structural shifts. We first estimate the no-shift model and then employ its extensions to which accounting for structural breaks, namely the sharp-shift model and the smooth-shift model.

The results from the point of modelling strategy imply that controlling for structural shifts plays an important role in order to determine the behavior of the per-capita income in Turkey. Specifically, the stochastic convergence analysis indicates that (i) the no-shift model evidences the divergence for 61 provinces, (ii) the sharp-shift model with one (two) break(s) supports the convergence for 45 (64) provinces, and (iii) the smooth-shift model provides the evidence on the divergence for 52 provinces. Finally, the findings from -convergence estimations put forth a stronger evidence in favor of the income divergence in Turkey.

The empirical results also reveal that the different approaches for modelling breaks lead to change in inferences. To be more specific, the no-shift model description finds out the divergence for more than 80% of Turkish provinces. This finding provides a room to implement the province-specific measures in order to decrease inter-provincial income differences. In contrast, the sharp-shift models show the income convergence - the disappearance of the income differences over time- which is consistent with the prediction of Solow growth model. Finally, the smooth-shift model -assuming the income shifts occurs gradual in nature- supports the divergence and hence the inter-provincial economic policies become important again. The findings indicate that there is an income divergence and the diverging provinces are located in the eastern and northern parts of Turkey. We discuss the possible causes of the divergence and discover three main facts (geographical conditions, terrorist incidents, and regional investment policies). We also enable to connect a link between the income and urbanization disparities in Turkey. While economic development and urbanization have tended to be in co-movement in Turkey, urbanization is not a stand-alone for the convergence because the horizontal imbalances between the western and the eastern provinces still prevail.

ENDNOTES

[1]Specifically, the share of agriculture in total income was 25 and 9 percent and the contribution of industry was 34 and 27 for 1980 and 2013, respectively.

[2]Some of the research also support the club convergence hypothesis meaning that per capita incomes of countries that are identical in their structural characteristics converge to one another in the long-run provided that their initial conditions are similar as well (e.g. Durlauf and Johnson,1995; Quah,1996; and Canova, 2004).

[3]The cross-sectional analysis also is subject to misspecification errors, homogeneity and linearity assumptions in model estimations.

[4]The inferences of standard methods are valid under these conditions: the economies must have identical first-order autoregressive dynamic structures and all explanatory variables control for all permanent cross-country differences.

[5]See for more details on this method, Henderson and Storeygard (2012).

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