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Abstract

The aim of the present article is to analyze the convergence of regional inflation rates in Turkey from 2004 to 2015 by adopting a distribution dynamics approach, namely discrete time Markovian chains. Convergence across regional inflation rates is politically a crucial matter for two reasons. First, if inflation rates differ largely between regions, monetary policy can hardly satisfy the needs of all regions equally. Such that, places which experience high inflation rates naturally require a contractionary monetary policy while the ones which experience low inflation need rather an expansionary monetary stance. Second, inflation differentials are likely to create a regional dispersion in real interest rates which induce differential effects on local economic growth. The outcomes of our research can be summarized in two groups. First, inflation disparities have declined over time, especially during the post-crisis period; after 2010. Hence, aggregate price stabilization and disinflation process in Turkey is coupled with convergence in inflation rates across regions. These results are confirmed using several methodologies (panel unit root tests and Kernel Density Estimates). Second, in addition to the findings in the literature, we found that regions change their relative inflation rate positions quite often. This indicates that regional inflation behaivor is random and non-structural as the relatively high and low inflationary places tend to change their quintiles frequently in time. Similarly, a geographical randomness of inflation is also verified using Moran I's test.

Keywords: Inflation convergence, regional inflation, distribution dynamics, Kernel density, Panel Unit Root

JEL Codes: R1, E3, E5,

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1. Introduction

In the literature on monetary economics, dispersion of inflation rates across the regions of a country may constitute severe policy distortions (Weber and Beck, 2005). Firstly, if inflation rates differ largely between regions, monetary policy can hardly satisfy the needs of all regions equally (Weber and Beck, 2005; Mundel 1961; Weyerstrass et al. 2011). Such that, places which experience high inflation rates naturally require a contractionary monetary policy while the ones which experience low inflation need rather an expansionary monetary stance (Weber and Beck, 2005). Furthermore, inflation differentials are likely to create a regional dispersion in the real interest rates which are likely to induce differential effects on the local economic growth (Yılmazkuday, 2013). Another policy problem regards the specific case of Turkey for which regional integration is seen as a necessity prior to the EU accession (Yeşilyurt and Elhorst, 2014). For these reasons, convergence across regional inflation rates is politically a crucial matter.

With regard to the literature on convergence, existing studies have mostly relied on Neo-classical growth theory and its empirical predictions (i.e. Solow, 1956; Barro and Sala-i Martin, 1992; Rey and Montouri, 1999). Within this stream, much of the attention has been devoted to testing the tendency of regional incomes or total factor productivity to converge. However, far little attention has been paid to the issue of inflation convergence (for some examples see Cecchetti et al. 2002; Weber and Beck, 2005; Yesilyurt, 2014).

Methodologies which have been so far used in order to test the inflation convergence are quite scant in the literature. Indeed, most of them rely on a class of Panel Unit root tests (see for some examples, Breitung and Das, 2003; Breitung, 2000; Chang 2002; 2004, Levin, Lin and Chu, 2002; Im et al., 2003) which are known as useful longitudinal tools in testing whether relative rates of inflation follow a stationary process and converge to an equilibrium.

However, the major drawback of such a methodology is that it gives no information about the intra-distributional dynamics, shape of the inflation distribution and its evolution over time (Quah, 1993a; Magrini, 2009). However, the distribution dynamics approach is more informative in that sense (Magrini, 2009). It provides information on both understanding the convergence trend since one can observe the evolution of the shape of relative inflation distribution and also it provides information on the mobility of regions within the distribution (Magrini, 2009).

So, the aim of the present study is to analyze the convergence of regional inflation rates in Turkey from 2004 to 2015 by adopting the distribution dynamics approach, namely, simple discrete time Markovian chains (Asmussen, 2003)). The regional and aggregate inflation dataset is obtained from Central Bank of Turkey (TCMB) ,Turkish Statistical Institute (Turkstat) and Ministry of Development.

Turkey is an interesting case of study as it includes large socio-economic and territorial imbalances (Yıldırım et al. 2009; Gezici and Hewings, 2007). There are, as well as, large differentials in inflation rates across provinces (Yeşilyurt and Elhorst, 2014). Moreover, Turkey has experienced a rapid stabilization and disinflation period over the last decades. Such that the annual inflation rate has declined from about 116 % (in 1994) to 8 % (in 2015). However, the distributional aspects of inflation within the country has not yet been adequately studied. This makes our analysis more interesting *per se.*

Remaining part of the paper is organized in a following way. In section 2, a summary of the related literature is provided. Section 3 is devoted to the empirical analysis which is composed of two parts. In 3.1, we implement a descriptive and explaratory analyses which document the stylized facts on both regional and national inflation in Turkey. In 3.2, we perform a formal convergence analysis by using first Panel Unit Root tests and then apply a distribution dynamics methodology. Finally, section 4 is devoted to concluding remarks.

2. Literature Review

In the existing literature, the issue of inflation convergence has been thoroughly and heatedly debated in a number of theoretical and empirical studies.

From a theoretical point of view, economic drivers of inflation convergence/divergence have been extensively discussed. Intensity of traded-goods sector and trade integration among countries are referred to as the major reasons fostering the convergence in price movements (Yılmazkuday, 2013). This is consistent with the Balassa-Samuelson effect which explains why prices are higher and non-convergent in non-traded sector (Balassa, 1964; Samuelson, 1964; Tunay and Silpağar, 2007). In other words, it implies that intensity of trade linkages across regions hamper the arbitrage driven profit possibilities and enhance the price equilibration (Yılmazkuday, 2013).

One of the other reasons why prices do not converge might be related to rigidities in wages or exchange rates (Becker, 2011). Any factor that prevents the nominal exchange rates and wages to adjust in response to an economic shock can be a reason for inflation differentials (Becker, 2011). Finally, asymmetric economic shocks that can change the demand/supply conditions in different countries can cause dispersed price movements ((Weber, 2004; Tunay and Silpağar, 2007).

On empirical grounds, the vast majority of the studies point to the tendency towards declining inflation disparities either at the cross-country or cross-regional level.

With regard to the cross-country examples, there is, one the one hand, a number of studies implemented for EU (European Union) countries. For instance, Siklos and Wohar (1997), Mentz and Sebastian (2003), Rogers, Hufbauer and Wada (2001), Kocenda and Papell (1997), Beck and Weber (2001), Holmes (2002), Beck et al. (2006) and Busetti et al. (2007) are among the studies which found evidence in favour of inflation convergence within EU. This finding is supported also theoretically as it is consistent with the conventional view that increased trade integration, financial linkages and migration as well as the introduction of common monetary system promote the price convergence (Rogers, 2007).

On the other hand, there has been a strand of studies focusing on inflation differentials across the regions of a country. Beck et al. (2006) have, for instance, focused on the regions of 6 EU member states and 11 U.S. Metropolitan areas over a period 1995-2004. They reported evidence in favor of two facts. First, compared to early 1990s, inflation dispersion has lowered within EU, therefore, a convergence trend has been observed. Second, inflation dispersion within U.S has been found lower compared to EU.

In an other study, Cecchetti et al. (2002) have investigated whether inflation rates in 19 major U.S. cities tend to converge over the period 1918-1995 and reported evidence in favor of convergence. Weber and Beck (2005) have examined the convergence process across 24 Metropolitan areas in U.S between 1980-2002, across 12 provinces in Canada between 1980-2002 and across 47 prefectures in Japan between 1985-2000. The main result of the paper is that regional dispersion of inflation rates has been found lowest in Japan and at the considerable level in U.S. and Canada. However, the disparities tend to decline in U.S-Canada sample whereas it tends to increase in Japan.

Although, an extensive literature exists on other countries, studies in this field are quite limited for Turkey. Initially, Tunay and Silpağar (2007) has examined the inflation convergence across geographical regions for a period 1994-2004 using monthly regional CPI (Consumer Price Index) data. They adopted a widely accepted Panel Unit Root test in their study. Specifically, they used the type of test developed by Breitung and Das (2003), Levin, Lin ve Chu (2002) and Im, Pesaran and Shin (2003) tests.In all tests, they reject the null hpothesis of non-stationary regional rates of inflation which indicate an evidence of convergence. Moreover, using panel regressions, they have shown that price movements in a region is spilled over to the neighboring regions significantly.

Consistently with this study, Akdi and Sahin (2007) have found a sectoral inflation convergence pattern over a period 1988-2007. More recently, Yılmazkuday (2013) has investigated whether inflation dispersion has structurally changed after the introduction of “inflation targeting” policy of Central Bank in January-2002. He employed monthly CPI data for 10 sub-groups of products and 7 geographical regions over a period 1994-2004. He found that both mean and standard deviation of inflation rates have declined following the inflation targeting policy. Moreover, it has also been claimed that the adoption of flexible exchange rate in 2001 (february) is another reason for such a decline.

Finally, Yeşilyurt (2014), has adopted monthly CPI data for 26 NUTS-2 regions over a period 2004-2011. She used a pairwise unit root test which is introduced initially by Pesaran (2007) and incorporated the structural breaks in series by using a technique developed by Zivot and Andrews (1992). As an outcome, she rejected the null hypothesis of no convergence and, therefore, found evidence in favor of declining inflation disparities.

Although existing studies on Turkey reflect, more or less, the same result, our contribution to the debate will be rather methodological. Technically, studies in the literature mostly focus either on panel unit root tests or traditional convergence methodologies like β or σ convergence. Both are criticized due to biases in regression techniques and the unreliable outcomes.(like. Galton’s Fallacy, Quah (1993b)). Moreover, these conventional methods are inadequate in terms providing more information on the shape of inflation distribution, its evolution over time and mobility of regions within the distribution (Magrini 2009). Specifically, distribution dynamics approach estimates the empirical distribution of regional incomes (i.e. Kernel density estimates), their evolution over time and the ergodic distribution (Magrini 2009). In this way, the researcher is able to observe whether the distribution tends to take a more homogenous and uni-modal form, which indicates a decline in income disparities, or vice versa, a bi-modal and more heterogenous form, which indicates an increase in disparities.Moreover, using discrete time markov transition matrices, the researcher is able to observe if the mobility of regions within the distribution high or low.

Thus, we pursue such a methodology in this paper by implementing an empirical analysis in the next section (3).

3. Empirical Analysis

3.1 Descriptive and Explaratory Analysis

The initial step in our analysis is to describe the historical evolution of inflation rate in Turkey. The data declared by Turkstat (Turkish Statistical Institute) reveal that percentage changes in CPI at the national level from 1983 to 2010 indicate an increasing trend of inflation until the mid-1990s and a sharpe decline afterwards, hitting the levels about 7-8 % after 2005.

Rapid changes in inflation rates deserve spending few words on its political and historical evolution. Over the last decades, high inflation has been a major policy concern of the government (Yeşilyurt, 2014; Yeşilyurt and Elhorst, 2014). Following the military revolution and economic crisis in 1980, a set of policies aiming at both discliplining the fiscal deficits and trade liberalization were applied. However, the outcomes were not successful in lowering the inflation. Thus, in 1994 the national inflation rate has reached a peak about 116 %. Public sector deficits, devaluation of Turkish liras against foreign currencies and, therefore, increased prices of imported goods, political instability and gulf war have been put forward as the major reasons for the hyperinflation (Yeşilyurt, 2014; Yeşilyurt and Elhorst, 2014).

In 5th April 1994, a new economic program was declared.Although inflation rates were reduced considerably, in 1999 an economic crisis and the earthquake hit the supply side of the economy and caused another pressure on prices (Yeşilyurt, 2014; Yeşilyurt and Elhorst, 2014).After the economic crisis in 2001, successful years in inflation have started (Yeşilyurt, 2014; Yeşilyurt and Elhorst, 2014). Tight fiscal and monetary policies and budget discipline played a major role in this process (Yeşilyurt, 2014; Yeşilyurt and Elhorst, 2014). An implicit inflation targeting policy was implemented during the years 2002-2005 (Yeşilyurt, 2014).After 2006, an explicit inflation targeting was applied (Yeşilyurt, 2014). In 2005, increases in oil price and a supply shock has caused an increase in price (Yeşilyurt, 2014). During the global economic crisis 2008-2009, a rise in the interest rates has led to lower the pressures on prices (Yeşilyurt, 2014). Finally, after 2010, a more stable price index was observed.

With regard to the regional dimension of inflation, several stylized facts can be mentioned. For that purpose, we document the geographical distribution of inflation rates among regions. Figure 1 below illustrates the percentage changes in CPI for 26 Nuts-2 regions over a period 2003-january:1-2015-March.

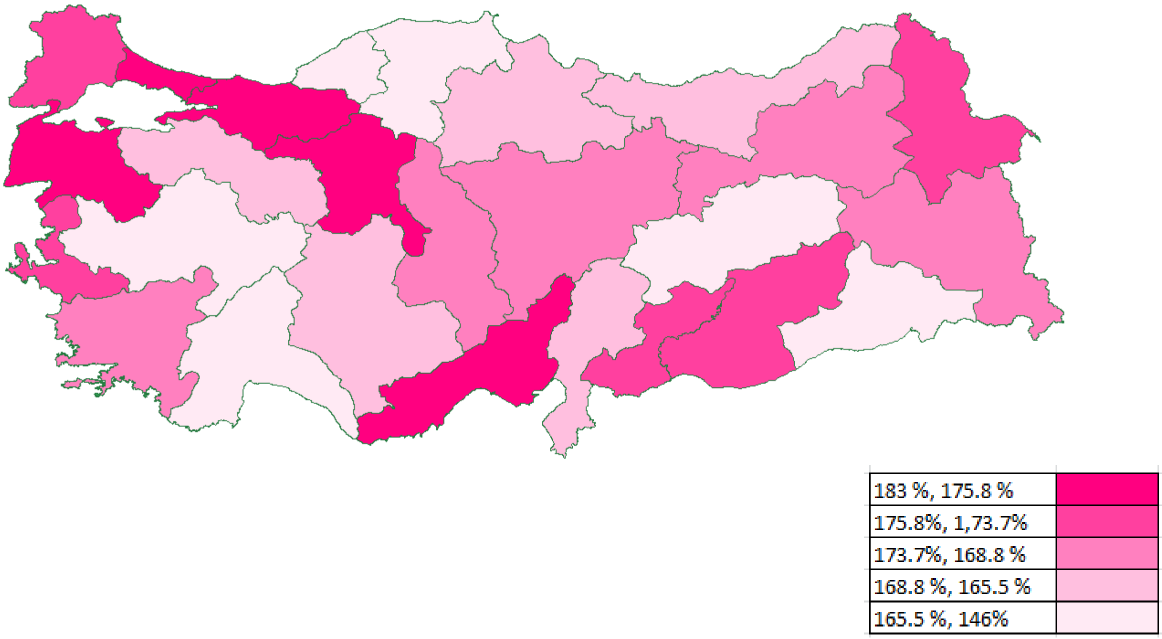

Figure 1. Geographical Distribution of Inflation Rates, source: TCMB

There is an important level of cross regional variation in inflation rates. The darkest color represents the regions which have the highest inflation rates while, by constrast, the lightest color represents the regions which have the lowest rates. The regions which have highest inflation are TR22 (Çanakkale-Balıkesir), TR51 (Ankara) and TR10 (İstanbul) which have respectively, 183 %, 179%, 178 % cumulative inflation rates over 12 years. The regions which have lowest inflation are TRC3 (Mardin-Batman-Şırnak-Siirt), TR61(Antalya-Isparta-Burdur) and TR81(Zonguldak-Karabük-Bartın) which have respectively 146 %, 158%, 162 % inflation rates.

High inflation is generally observed around Marmara region. This can be for several reasons. First, since it is an industrial base, it attracts many inward migration, which makes demand grow faster than the other regions. Indeed, the wages are most probably higher which causes a deman-pull inflation (Barth and Bennet, 1975). Apart from demand-side, supply side factors are also quite important(Barth and Bennet, 1975).. Such that intermediate goods are known to be intensively imported in this region. Hence, any depreciation in Turkish lira against foreign currencies is likely to increase the cost of inputs largely (capital goods, raw materials etc.), leading to a cost-push inflation (Barth and Bennet, 1975).

Looking at the general picture, however, we do not observe a distinct geographical pattern in inflation. The commonly found east/west dualism in economic development is not observed for inflation. The visual inspection of the map gives us the idea that changes in the price levels is rather randomly distributed within the country. This makes it even harder to explain the phenomenon.

Anyhow, in order to confirm this statistically and to understand whether or not the inflation rates are distributed in a spatially correlated manner, we test the spatial dependence using Moran I's test which is initially introduced by Moran (1950) and widely used in the empirical literature (Rey, 2001). The test statistic is in the following form (Rey, 2001)[1]:

1 The Moran I test's formula is obtained from Rey(2001).

$$I = \frac{n}{\sum_i \sum_j w_{i,j}} \frac{\sum_i \sum_j \quad (X-\bar{X}_i)(X-\bar{X}_i)}{\sum_i (X-\bar{X}_i)^2} \qquad (2)$$

where x is a variable of interest, $\acute{X}_i$ is its cross-sectional mean. *w* is a spatial weight matrix. It is in the form of raw standardized inverse distance matrix. Hence, the nearest neighbors get a high weight in this scheme.

A positive and significant *I* would indicate a positive spatial correlation which means that regions which have similar inflation rates locate nearby. However, what we observe from our test is totally different. The estimated Moran I's statistic is negative as well as insignificant (Table 1).So, one may conclude that inflation rates in Turkey seem to follow a random geographical distribution.

Table 1. Moran I's Test

Test Statistics	*Values*
Moran I's statistics	-0,053
Expectation	-0,04
Variance	0,002
P-Value	0,61

Note: raw standardized inverse matrix has been used.

Overall, the cross regional differentials in inflation can not be neglected as it ranges in a large interval (between 146 % and 183 %). Moreover, its geographical distribution is quite random. The descriptive analysis, however, does not provide any information about inflation convergence. Therefore, we pursue this analysis in the next section.

3.2 Convergence Analysis

The evolution of inflation disparities is analyzed in current part. Initially, we present in Figure 2 the cross-sectional standard deviation (SD) of regional yearly inflation rates over time (from 2003-january:1-2015-March. Regional Inflation rate, in this case has been defined as the first differences of 12-month moving CPI (in natural logarithms):

$$\pi_t = \ln(CPI_t) - \ln(CPI_{t-12})$$

where t indicates the months.

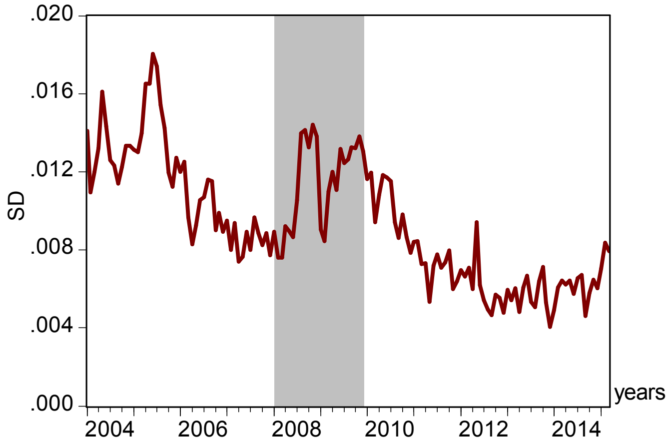

Figure 2. Cross sectional SD of Inflation Rates, source: TCMB

Looking at the SD of regional inflation rates, it is immediate to note that a tendency towards a decline in dispersion is obvious. In other words, regions tend to become more equal in their inflation rates and this indicates a preliminary evidence of inflation convergence.

The only exception that does not fit to this trend is the period of global economic crisis during 2008 and 2009 which is shaded in gray color. During the financial crisis, regional price levels increase arbitrarily and this causes an inflation differential.

In order to provide a supportive and statistical evidence on convergence, we apply a unit root test on regional inflation rates shown in Figure 3. Specifically, the test is developed by Levin, Lin and Chu (2002) (LLC) and very widely used in this field. The test relies on the following ADF (Augmented Dickey Fuller) regression (Dickey and Fuller, 1979) [2]:

$$\Delta x_{i,t} = \alpha x_{i,t-1} + \sum_{j=1}^{\rho j} \beta_{i,j} \Delta x_{i,t-j} + Y'_{i,t}\delta + e_{i,t}$$

where x is the variable of interest. In our case, x represents the relative annual regional inflation rates. Specifically, it is the cross sectionally de-meaned π_t where $\acute{\pi}_t$ is the cross-sectional average of inflation rates at time t:

$$x_{i,t} = \pi_{i,t} - \acute{\pi}_t$$

The sign and significance of α parameter, which is a common coefficient for all cross sectional units, is the indicator of convergence (or divergence). The null and alternative hypothesis take the following form:

Ho: α=0 (unit root and non-stationary series)

2 The panel unit root speicification and ADF regression are obtained from Eviews 6 program's user guide.The empirical analysis in this paper is implemented using Eviews 6, Eviews 4, Excel, R 3.12 software programs

Ha: α<0 (no unit root and stationary series)

In case, α=0, there is an evidence of unit root process and no indication of stationary relative inflation rates. By constrast, α<0 indicates an evidence of no unit root and convergence of relative incomes to an equilibrium level.

In LLC test, a different lag order for each region has been allowed. The lag order is repsented by ρ In our case, we determine it using three different measure; Akaike (1974), Schwarz (1978) and Hannan and Quinn (1979) information criteria. We set the maximum possible time lag as 12 months.

The outcomes of the test are summarized in Table 2. The α value is negative and significant at 1% level in all regressions. This indicates a strong and robust evidence of the rejection of null hypothesis of a unit root. Therefore, it suggests the presence of convergence pattern and declining differentials across regional inflation areas.

Table 2. Levin, Lin and Chu (2002), Panel Unit Root Test

Lag Selection Criteria	αValue	***P-Values***
Akaike	-11.29***	0.000
Schwartz	-15.68***	0.000
Hannan-Quinn	-13.98***	0.000

Note: Max. Lag=12 months, no intercept or trend, common unit root, eviews 6

Hence the declining disparities in inflation rates are confirmed both visually, through the graph of standard deviations and, ineferentially, by panel unit root tests.

3.3 Distribution Dynamics Analysis

The distributional aspects of inflation help providing additional insights on the convergence process.
To be able to pursue such an analysis, we, first, need to discretize our dataset by dividing the period of analysis into three sub-periods. These are the pre-crisis period 2004-2007, crisis period 2008-2009, post-crisis 2010-2014 period.This type of division is relevant as the sub-periods cover different phases of economic cycle during which the regions may show arbitrary price reactions to economic disturbances. Moreover, it also captures the effect of economic crisis and related policy changes.

From a cross-sectional viewpoint, we divide the regions into 5 classes with respect to their annual average inflation rates. Methodologically, this is needed in order to make the analysis feasible and implementable. We had to discreticise the data to be able to create relative inflation classes and compare the inflation behaivor with each other. We choose 5 classes as it is a common practice in this literature.

The regions which have the highest inflation rates are included in the first quintile, the ones which experience the lowest annual average inflation are included in the 5th quintile. The documentation of these quintiles are presented in Table 3 below.

Table 3. Regional inflation rates

Quintiles	Regions	Pre-crisis, 2004-2007	Regions	Crisis, 2008-2009	Regions	Post-Crisis, 2010-2014
1st Quintile	TR42	9,48	TRC2	9,12	TRC1	7,77
	TR10	9,47	TRB2	9,12	TRA1	7,58
	TR22	9,14	TRC1	8,90	TRA2	7,53
	TR41	9,01	TRB1	8,67	TRC2	7,52
	TR32	8,99	TR62	8,41	TRB1	7,52
2nd Quintile	TR31	8,98	TR63	8,37	TR71	7,45
	TR51	8,97	TRC3	8,28	TR21	7,33
	TR21	8,83	TR90	8,23	TR31	7,30
	TR62	8,75	TR71	8,21	TR22	7,29
	TR52	8,59	TRA2	7,85	TR51	7,27
3rd Quintile	TR83	8,36	TR51	7,83	TR82	7,26
	TRA1	8,36	TR72	7,53	TR72	7,17
	TR72	8,29	TR22	7,49	TR90	7,17
	TR81	8,25	TR21	7,35	TRB2	7,15
	TRA2	8,19	TR83	7,35	TR62	7,13
4th Quintile	TR61	8,12	TR61	7,29	TR81	7,12
	TR90	8,10	TR10	7,22	TR63	7,12
	TR71	8,06	TRA1	7,15	TR33	7,11
	TR33	8,06	TR82	7,01	TR83	7,09
	TRB2	8,02	TR31	6,98	TR10	7,03
5th Quintile	TR63	8,00	TR33	6,98	TR52	6,98
	TR82	7,98	TR52	6,93	TR61	6,95
	TRC2	7,78	TR42	6,92	TR32	6,92
	TRC1	7,73	TR32	6,89	TR42	6,88
	TRB1	7,67	TR41	6,73	TR41	6,85
	TRC3	6,79	TR81	6,45	TRC3	6,79

Then, we estimate the Kernel density functions of regional inflation rates for each period in order to understand the evolution of the shape of regional inflation distribution. Results are shown in Figure 3.

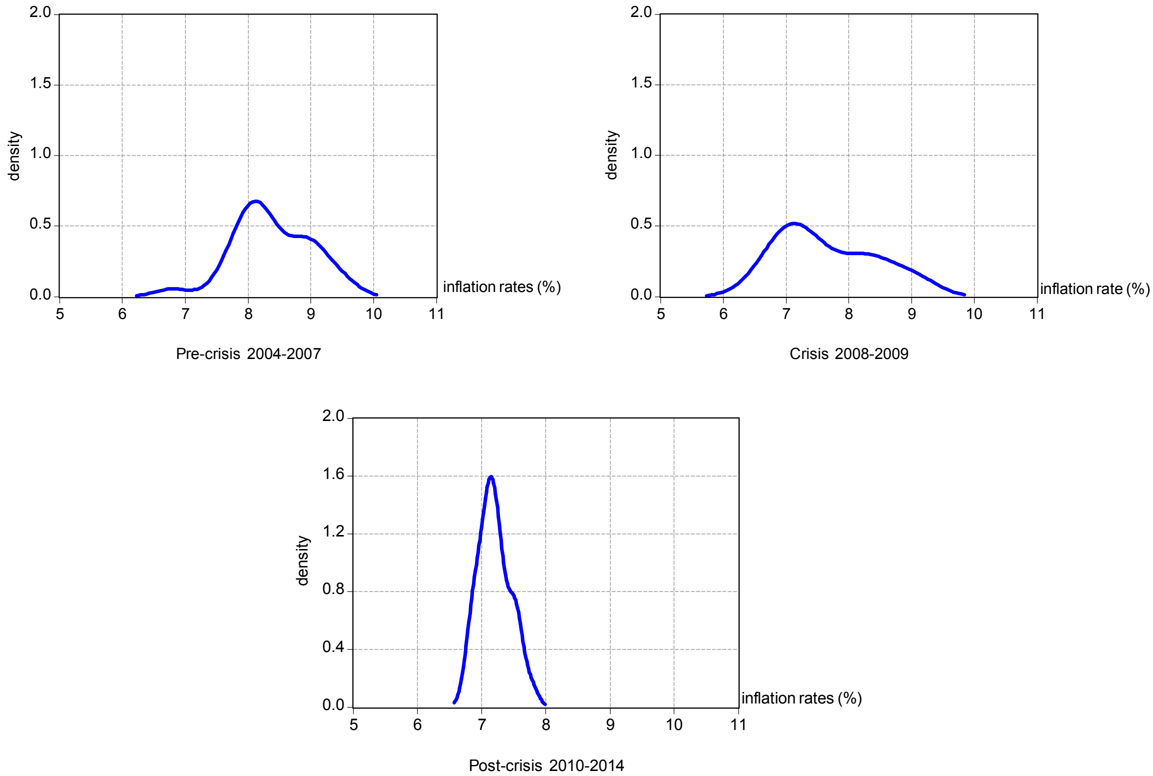

***Fig**. 3.* Kernel Density estimation of inflation rates, normal distr. Eviews 4.

At a glance, during the first period, the probability mass is concentrated on two main modes. It, therefore, seems to be a bi-modal distribution. On the one hand, the highest probability mass is surrounded about 8 % inflation rate as a first mode. On the other hand, the second mode is about on 9 % rate which is much less obvious compared to the first one. During the second period, the shape of distribution remains almost constant. The only difference is that the probability mass seems more uni-form rather than bi-modal and the probability mass has concentrated on 7 % infation rate instead of 8 %. Looking at these results, one may argue that national inflation rates seem to have declined during the crisis while its regional distribution is not affected much. The decline in overall inflation during the recession seems plausible since the unemployment tends to rise, real wages and aggregate demand tend to decline. Therefore, prices increase at a slower rate since aggregate demand do not grow fast. In the last period, however, the results are quite different. During 2010-2014, the regional inflation rates get a very normally shaped distribution with a much higher cross-regional homogeneity compared to the previous years. All this homogenization process point to a tendency to decline in inflation disparities.

Another merit of this methodology is that it provides information on intra-distributional mobility of regions. In other words, it helps figuring out how mobile the regions are within the distribution. To understand this, we create Transition Markov Matrices by mapping the regional inflation distribution in two consequitive periods (Asmussen, 2003). We calculate two matrices. The first one shows the Transition Markov Matrice between Pre-crisis and Crisis periods (in 4.1) and the second one shows the Transition Markov Matrice between Crisis and Post-Crisis periods (in 4.2).

Specifically, each value in these matrices show the number of regions moving between two quintiles from previous period to the current period. For instance, the value of “3” in Table 4.1 means that there are 3 regions which were in the 5th quintile during (2004-2007) period and they have moved to the 1st quintile in 2008-2009 period. The number of regions included in the diagonal indicate the degree of immobility as those regions do not change their quintiles over the periods.

In 4.1, the immobility seems quite low. Only 2 regions out of 26 keep their relative position and rest of the 24 regions have switched their quintiles between the periods. In 4.2, 10 regions keep their quintile and 16 regions change.

Hence, one may argue that relative position of regional inflation rates is far from a structural pattern. In constrast, relatively high and low inflationary places tend to change their quintiles frequently in time, indicating a random behavior rather than structural.

Below diagonal part (blue colored) represents the regions which move to a better quintile (lower inflation) and above diagonal part (orange colored) represents the regions which move to a worse quintile (higher inflation). In 4.1, 10 regions improve their quintiles whereas 12 regions worsen. Similarly, in 4.2, 9 regions improve their quintiles,whereas 6 regions worsen.

Overall, the distribution dynamics analyses indicate two main results. First, the distribution of regional inflation rates manifest a tendency to exhibit a uni-modal and homogenous distribution form, which complements the convergence result found in panel unit root tests. Second, we have learned that within this distribution, mobility of regions are quite high and inflation behavior is not structural.

Table 4. Transition Markov Matrices

4.1

				Crisis		
		1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
	1st Quintile	**0**	0	1	1	3
	2nd Quintile	1	**0**	2	1	1
Pre-crisis	3rd Quintile	0	1	**2**	1	1
	4th Quintile	1	2	0	**1**	1
	5th Quintile	3	2	0	1	**0**

4.2

				Post-Crisis		
		1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
	1st Quintile	**3**	0	2	0	0
	2nd Quintile	1	**1**	1	1	1
Crisis	3rd Quintile	0	3	**1**	1	0
	4th Quintile	1	1	1	**1**	1
	5th Quintile	0	0	0	2	**4**

4. Conclusions

Current paper has analyzed the regional inflation convergence in Turkey over 2004-2015 period by adopting the existing methodologies and a relatively newer methodology. The outcomes of the research can be summarized in two parts.

First, the inflation disparities have declined over time, especially during the post-crisis period; after 2010. Hence, overall price stabilization and disinflation process in Turkey is coupled with also an inflation convergence across regions. The inflation targeting policy has also contributed to this process (Yılmazkuday, 2013). These results are confirmed using several methodologies,(i.e. SD graph, panel unit root tests and Kernel Density Estimates) and they seem consistent with the existing literature.

Second, in addition to the findings in the literature, we found that regions change their relative inflation rate positions quite often. This indicates that regional inflation behaivor is random in time and non-structural as the relatively high and low inflationary places tend to change their quintiles frequently. Similarly, a geographical randomness is also verified using Moran I’s test.

All these results imply several policy suggestions. First, achieving inflation convergence is a harder task than initially understood as it seems a random behaivor and the economic drivers behind this should be carefully analyzed by policy makers. Second, trade integration should be promoted so to make regional price converge each other. Finally, during the possible recessions in the future, not only the aggregate disinflation should be targeted, but also regional dispersion should be cared with a great devotion as it is critical to Central Bank’s policy success.

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