TURKISH ECONOMIC ASSOCIATION

DISCUSSION PAPER 2015/6

http://www.tek.org.tr

REGIONAL EMPLOYMENT VOLATILITY IN TURKEY: CAUSES AND CONSEQUENCES

Hasan Engin Duran

March , 2015

REGIONAL EMPLOYMENT VOLATILITY IN TURKEY: CAUSES AND CONSEQUENCES

Hasan Engin Duran

Abstract

Regional employment volatility is an undesirable phenomenon which describes a strongly fluctuating pattern of employment, thus, "instability" of a local economy. In the literature on this field, much of the attention has been paid to two main issues. First, a group studies has investigated the evolution of national economic volatility and searched for a tendency towards the moderation or amplification of economic cycles. Second, strand of scholars has analyzed the socio-economic and geographical determinants behind the cross-regional variation of volatility. However, far little attention has been devoted to understanding the causes and consequences of this phenomenon in developing countries So, aim of the present study is actually two fold. First, we analyze the cross-regional determinants of employment volatility in Turkey and decompose relative importance of the sources of employment growth shocks. Second, we examine the relationship between regional instability and economic convergence. In terms of methodology, we use a range of panel data, time series models and nonparametric tools such Random Effects Model; PANEL VAR model and Conditional Kernel Density Estimations. We adopt employment data and many other explanatory variables for NUTS-II level regions and over a period 2004-2013. Our analyses indicate three main results: First, there are huge differences across regions in employment volatility. Second, volatility of regions is mostly related to demographic and market size characteristics of the regions. So, regions which have high rate of labor market participation (with active labor force) and moderated growth rates; the ones which constitute greater market area tend to experience relatively more smoothed employment pattern and, thus, enjoy a stable economy. Moreover, we have shown that regional economic shocks are mostly driven by region specific disturbances rather than purely nationwide or sectoral shocks. Third, regional instability is found as an important barrier against the fulfillment of economic convergence.

Keywords : Employment Volatility, Instability, PANEL-VAR, Random Effects; Kernel Density, Income Convergence

Jel Codes: R11, R15, E32, J01

Address for Correspondence:

Izmir Institute of Technology,

Department of City and Regional Planning,

Urla-Izmir,

Tel: +905068455983

enginduran@iyte.edu.tr

1. Introduction

Regional employment volatility is an undesirable phenomenon which describes a strongly fluctuating pattern of employment, thus, "instability" of a local economy (Siegel et. al. 1995; Wagner, 2000). It is often coupled with high unemployment rates since the instability creates displaced workers who can hardly find new jobs (Baldwin and Brown, 2004). Volatility is crucial from a policy viewpoint as well. It creates difficulty for governments to plan their investments in public goods and infrastructure (Baldwin and Brown, 2004). In contrast, "stability" is often desirable as it promotes long-run investments, employment and growth (Schoenning and Sweeney, 1992)

In the literature on employment volatility, much of the attention has been paid to two main issues. First, a group studies has investigated the evolution of national economic volatility and searched for a tendency towards the moderation or amplification of economic cycles. (Blanchard and Simon, 2001; Kim and Nelson, 1999; McConnel and Perez-Quiros, 2000; Owyang et al. 2008; Carlino et al. 2013; 2003; Buch, 2004). The commonly accepted finding is the 'greatly moderation' of employment cycles in U.S. since the mid-1980s. This has mostly been attributed to the improvements in monetary policy (Owyang et al. 2008; Boivin and Giannoni, 2006); to the improved inventory management techniques of firms (i.e. just in time production) (Kahn et al. 2002); to the stabilizing effect of banking deregulation policies during 1980s (Dynan, 2006) or, simply, to the smaller shocks received to energy prices and productivity. (Carlino et al. 2003; Carlino et al. 2013).

As a Second issue, strand of scholars has analyzed the socio-economic and geographical determinants behind the cross-regional variation of volatility. A number of hypotheses have been put forward in this field.

Initially, regional instability has been related to the lack of ***industrial diversification*** according to which the regions that have relatively more concentrated industrial structure are likely to experience bigger fluctuations (Brewer and Moomaw, 1985; Kort, 1981; Malizia and Ke, 1993, Trendle, 2006). Put it differently, variety of sectors within a region play a stabilizing role as a negative shock to one sector will be offset by a positive shock to others. (Brewer and Moomaw, 1985; Kort, 1981; Malizia and Ke, 1993, Trendle, 2006). Second hypothesis regards the regional ***openness to trade***. According to this hypothesis, integration to foreign markets may induce the volatility as the region becomes more exposed to global shocks and currency fluctuations. (Baldwin and Brown, 2004). Third, ***demographic characteristics*** of regions such as high share of young, inactive and uneducated labor force are referred to as main sources of volatility (Owyang et al. 2008; Jaimovic and Siu, 2009; Lee and Miller, 2000; Trendle, 2006; Flesiher and Rhodes, 1976; Ezcurra, 2010). As a fourth hypothesis, the enlargement of the regional ***market size*** may cause a decline in employment volatility as the availability of many job incentives in big markets increases the likelihood of quick job matches (Begovic, 1992; Tredle, 2006; Malizia and ke, 1993; Kort, 1981; Brewer and Moomaw, 1985). Fifth, ***sectoral structure*** of the region is also critical. Regions that include cyclically sensitive and credit dependent industries, i.e. durable and manufacturing goods, are likely to exhibit pronounced fluctuations. (Fratesi and Pose, 2007; Kangarashu and Pekkala, 2004; Carlino et al. 2003; 2013). As a last hypothesis, ***regional output growth*** and ***structural changes in industrial specialization*** are argued as other influencing factors (Malizia and Ke, 1993; Baldwin and Brown, 2004; Ezcurra, 2010).

Although the issues above have been thoroughly and heatedly discussed, there exist still crucial and open points in the literature. So, we intend to contribute to the debate in three ways:

First, the issue of regional instability has been mostly studied for US economy. The developing economies have instead been largely ignored. Among others, Turkey is a special case and convenient place for study as there exist large spatial imbalances, i.e. east/west dualism. The literature on Turkey has mainly focused on regional income inequalities and convergence while ignoring the "instability" issue (Filiztekin, 1999; Karaca, 2004). The commonly accepted finding is the lack of convergence and highly persistent inequalities across regions. (Gezici and Hewings, 2004; Yıldırım et al. 2009) which have been attributed to structural problems of backward regions, i.e. lack of human capital, fixed investments, infrastructure etc., or to the liberal policies favoring the already developed regions. To the best of our knowledge, this paper represents the first attempt to study the regional economic volatility in Turkey.

The second contribution regards the link between regional volatility and convergence. Although employment volatility and its determinants have been well studied in the literature, its impact on regional income convergence remains rather unexplained. However, we argue and show that "instability" is an important source of income inequality since the underdeveloped regions which are known as more "volatile" can hardly attract the investments and cannot fulfill their potential for convergence.

Third, from a methodological point of view, the determinants of volatility have always been accepted as exogenous in the literature. However, we relax this assumption by taking into account the unobserved heterogeneity and endogeneity of variables in our panel data analysis.

Overall, aim of the present study is to investigate, first, the socio-economic and geographical determinants behind the cross-regional variation of volatility and, second, the impact of regional instability on the income inequalities across NUTS-2 level Turkish regions for a period 2004- 2013. In order to pursue such an analysis, we adopt a range of methodologies, i.e. time series (i.e. VAR), spatial and panel data models. In terms of data sources, all the data used in this paper has been obtained from TUIK (Turkish Statistical Institute) with the only exception of interest rate series that is obtained from TCMB (Central Bank of Turkey).[1]

Remaining part of the paper is organized as follows: In section 2, we provide a detailed review of the debate on regional employment volatility. Section 3 is devoted to figuring out the stylized facts of volatility in Turkey by illustrating its evolution over time and geographical distribution. In section 4, we implement our empirical analysis in 3-steps. In 4.1, we set up a panel regression model to analyze the determinants behind cross-regional variation in instability. In 4.2 we decompose the sources of regional employment shocks using a PANEL VAR model and determine the relative importance of region specific, industry specific and aggregate shocks in volatility patterns. In 4.3, we analyze the link between regional instability and income convergence using a cross sectional regression and distribution dynamics approach.

2. Literature Review

As anticipated, existing studies can be categorized into two folds. One group tries to examine the evolution of volatility over time and the second group attempts to analyze the socio-economic determinants behind regional volatility. A detailed account of each is provided in the present section.

i. Evolution of volatility over time

The vast majority of the studies in this field have focused on the U.S. economy. As a common result, volatility was found to manifest a clear tendency to decline over time. This has been expressed with a famous term "greatly moderation" of national economic cycle.

[1] The following softwares have been used in empirical analysis; STATA, Eviews 4, Eviews 6; "R" open source packages;BUSY software.

Among the proponents of this stream, Blanchard and Simon (2001) has analyzed the evolution of output gap volatility from 1952 to 2000 and reported a trend decline. Likewise, Kim and Nelson (1999) and McConnel and Perez-Quiros (2000) have investigated the GDP growth volatility in U.S. from 1953:2 to 1997:1 and from 1953:2 to 1999:2 respectively. Both studies have found an evidence of discrete step reduction in volatility at about 1984:1. Chauvet and Potter (2001) have adopted a more comprehensive approach and reported a volatility decline in various macro-variables such as output, consumption, employment and prices. (from 1959Q2 to 2000Q4).

A number of reasons behind the greatly moderation of cycles have been discussed. Structural shifts in the U.S economy (Zarnowitz and Moore, 1986), improved inventory management methods (McConneş and Perez-Quiros (2000)), improved monetary policy actions (Taylor, 1999) and smaller shocks received (Stock and Watson, 2003) have been suggested as the main factors.

Regarding the studies focusing on other countries, Buch et al. (2004) have analyzed the evolution of output volatility in Germany from 1970:1 to 2001:4 and reported evidence of declining patterns, particularly after the unification of East-West Germany. Similarly, Simon (2001) who have analyzed the evolution of volatility in Australia over 40 years, Hakura (2007) in a cross-section of countries from 1970 to 2003 and Kent et al. (2005) in a panel of 20 OECD countries from 1983 to 2003 have found a declining pattern as well.

From a methodological point of view, a range of time series methods have been employed to analyze the changes in volatility. The simplest form is the charting the evolution of volatility over time using either sub-periods or rolling windows. The decline is also tested with more complex models, i.e. ARCH (Autoregressive Conditional Heteroskedasticity) model in which both structural breaks and trend declines in conditional output volatility can be tested (Buch et al. 2004). Inclan-Tiao test, CUSUM squares test and Markov-Switching models are among the methodologies that have been adopted to test the possible structural breaks in volatility.

In contrast to the studies at the national level, far little attention has been paid to the regional analyses. For instance, Carlino et al. (2003) have used a quarterly non-agriculture employment data for 38. U.S. States and reported evidence of declining volatility from 1952 to 1995. Similarly, Owyang et al. (2008) has analyzed the monthly payroll employment data for 38 US states from 1956 to 2004 and found evidence in favor of large cross-regional differences in the magnitude and timing of volatility declines. Likewise, Carlino et al. (2013) has analyzed the state-level quarterly payroll employment data from 1956:3 to 2004:2 and found a high variation across states in the level of and decrease in volatility. Lastly, Buch and Schlotter (2011) has examined the evolution of output instability in German states from 1970 to 2005 and reported a persistent and unclear evolution.

With regard to the literature on Turkey, studies dealing with economic volatility are rather scant. At the national level, one exceptional study is implemented by Berument et al. (2011) who have analyzed the relationship between output growth and volatility in turkey between 1987 and 2007. They conclude that there is a negative relationship between growth and its volatility. Moreover, they showed that volatility has a detrimental effect on investments and total factor productivity (TFP) which represents a "harmful" effect on growth. Thus, their study implies a non-decreasing but persistent pattern of output instability with alternating high and low volatile periods, moving in accordance with low and high growth times

ii. Determinants of regional volatility

It is possible to partition the determinants of regional volatility into several categories (hypotheses) each of which attempts to explain why some regions exhibit higher cyclical volatility than others.

Industrial Diversity Hypothesis

It is an early hypothesis which goes back to at least few decades (see Dissart, 2003 for a review). It states that regions which include a wide range of industries are likely to be less sensitive to industry-specific shocks and, therefore, tend to experience smaller fluctuations (Brewer and Moomaw, 1985; Kort, 1981; Malizia and Ke, 1993, Trendle, 2006). In other words, variety of sectors within a region play a stabilizing role as the employment decline in one sector will be offset by an increase in other sectors. (Brewer and Moomaw, 1985; Kort, 1981; Malizia and Ke, 1993, Trendle, 2006). Co-existence of stable and instable industries creates, in that case, a risk-sharing mechanism, that helps smoothing the regional employment pattern.

In contrast to these views, Smith and Gibson (1998) argue that inclusion of stable industries is more important than overall diversification. Likewise, Wasylenko and Erickson (1978) criticize the conventional measures of diversification as they cannot distinguish between an economy specializing in stable industries (i.e. public services) and instable industries (i.e. manufacturing, automobile)

Empirically, the diversity hypothesis has been supported by Kort (1981) who has found a negative association between industrial diversity and regional employment instability for 106 Metropolitan Statistical Areas (MSA) in U.S. for the period 1967-1976, Malizia and Ke (1993) who have found a stabilizing effect of industrial diversity on the MSA level economies (in U.S.) for a period 1972 -1988 and Trendle (2006) who has examined the same issue for local government areas of Queensland (Australia) for a period 1996-2001. Other supportive studies are implemented by Wundt (1992); Simon and Nardelli (1992); Brewer and Moomaw (1985); Baldwin and Brown (2004), etc.

By contrast, only few studies have reported insignificant relationship between the industrial diversity and regional volatility (Jackson, 1984; Attaran, 1986).

Demographic Structure Hypothesis

The second hypothesis points to the importance of regional differences in demographic characteristics. According to this, greater volatility can be related to a high share of young population (Owyang et al. 2009; Jaimovic and Siu, 2009); lack of human capital and education (Le and Miller, 2000; Trendle, 2006); high percentage of female (Trendle, 2006) and lack of active labor force within the region (i.e. low participation to labor force) (Flesiher and Rhodes, 1976; Ezcurra, 2010).

The young population is known as “volatile” cohort as the employees are relatively unexperienced. A high job turnover is, therefore, expected. Similarly, female labor force is also subject to unstable jobs as they are in general, part time and in causal sense (Malizia and Ke, 1993; Trendle, 2006). In contrast, educated labor force, i.e. high skilled workers and managers are likely to have more stable jobs than low skilled workers (Le and Miller, 2000; Trendle, 2006). In a similar vein, share of active labor force in a region is also important for stability. Low participation to labor market reflects the inadequacy of human capital investments in the region. Thus, it represents higher risks of being laid off for workers. In such case, workers are likely to have high job turnover and instable employment. (Fleisher and Rhodes, 1976; Elhorst, 2003; Ezcurra, 2010)

Empirically, demographic factors are tested in various papers. In Owyang’s et al. (2008) study, the effect of education (-) and age (+) on the regional volatility are in contrast with the expectations. Likewise, Carlino et al. (2003) have reported that education level (high percentage of college graduates) in a state is associated with greater volatility.

In accordance with expectations, high share of active labor force is coupled with low regional instability among Euopean Regions. (Ezcurra’s (2010))

Market Size Hypothesis

Third, regional market size is referred to as another critical determinant (Begovic, 1992; Tredle, 2006; Malizia and Ke, 1993; Kort, 1981; Brewer and Moomaw, 1985). It is argued that regional economies which constitute a larger market area (measured by the level of employment or population) are likely to provide quicker job matches through the availability of many job offers and job seekers (Elhorst, 2001, Trendle, 2006). Hence, they will be able to absorb economic shocks easier and are, therefore, likely to exhibit a more smoothed pattern of employment (Begovic, 1992; Tredle, 2006; Malizia and ke, 1993; Kort, 1981; Brewer and Moomaw, 1985).

Similar to these arguments, Thompson (1965); Rodgers (1957) and Marshall (1975) claim that large urban economies are likely to have more diversified industrial structure as there is a need for the variety of commodities and services. Hence, these areas are likely to have sluggish responses to industry specific and aggregate economic shocks.

A counter argument to the conventional views above is provided by Fujita et al. (1999). They claim an opposite effect of market size that can be expected as larger regions are characterized by selling their goods in local markets which makes them become exposed more to local economic shocks.

Empirically, the market size hypothesis has been tested by several scholars. Great majority of them supports the validity of the hypothesis. For instance, in Trendle (2006); Baldwin and Brown (2004); Ezcurra (2010) employment size of the region is associated with lower cycle volatility.

Trade Openness Hypothesis

As a fourth hypothesis, regional trade openness has been emphasized in the literature. Its effect can actually be two fold.

On the one hand, integration to foreign markets may induce the volatility as the region becomes more exposed to global shocks and currency fluctuations. (Baldwin and Brown,2004). Moreover, falling trade barriers may, indeed, help the region become increasingly specialized in accordance with comparative advantage (Ricardo), relative factor endowments (Ohlin, 1933) and technological differences across industries (Krugman, 1994; Howes and Markusen, 1993; Baldwin and Brown, 2004). Hence, specialization (induced by trade intensity) may cause pronounced fluctuations in employment (Howes and Markusen, 1993; Baldwin and Brown, 2004).

On the other hand, the opposite effect of trade can also be true. In that case, exposure to foreign markets helps diversifying geographically the marketing area of firms by reducing the importance of local markets. Thus, it eliminates the risk of a local economic downturn (Baldwin and Brown,2004). This effect is expected to be more pronounced in case foreign and domestic shocks are imperfectly correlated. (Buch and Schlotter, 2011)

Empirically, trade hypothesis has been tested in few studies. For instance, Baldwin and Brown (2004) have found a dampening effect of export intensity on regional instability of Canadian regions over the period 1976-1997. In contrast, Carlino et al. (2003) reported a controversial evidence. Such that, high volatility in state-level economies (in U.S). is positively associated with the degree of trade openness. Lastly, different from other two studies, Buch and Schlotter (2011) have found an insignificant relationship between trade openness and instability of German States.

Growth and Structural Change Hypotheses

Another hypothesis considers the regional economic growth and structural changes in sectoral mix. It has been claimed a U-shaped relationship between the growth rate of a region and its volatility (Malizia and Ke, 1993; Baldwin and Brown, 2004; Ezcurra, 2010). So, the very slowly growing regions are likely to experience higher volatility since the entry or exit of new firms to the market creates instability (Malizia and Ke, 1993; Baldwin and Brown, 2004; Ezcurra, 2010). However, beyond a threshold, economic growth creates a stability up to a certain level. The very fast growing regions, instead, exhibit a volatile pattern of employment as they are likely to include new, high-tech and dynamic industries (Malizia and Ke, 1993; Baldwin and Brown, 2004; Ezcurra, 2010).

Similarly, regions that tend to experience a rapid transformation in industrial structure (i.e. conversion from an agricultural production to manufacturing, or to services) are expected to have greater fluctuations in employment. This has been shown empirically in Trendle (2006).

Industrial Mix Hypothesis

Lastly, sectoral decomposition of employment is also of great importance. To the extent that the region consists of cyclically sensitive industries, it is more likely to experience pronounced fluctuations. Manufacturing goods, particularly durable and high-tech products are known to be excessively vulnerable to economic circumstances; they are credit dependent and sensitive to changes in monetary policy (i.e. interest rates) (Carlino et al. 2013; 2003; Owyang et al. 2009). Moreover, these goods are referred to as non-urgent and postponable products, for which the demand falls sharply in case of an economic downturn.
In contrast, non-market and public services are known to be cyclically sheltered sectors and, therefore, are likely to have less ample fluctuations (Fratesi and Pose, 2007; Kangarashu and Pekkala, 2004).

3. Stylized Facts

Here, we start our empirical analysis by figuring out several stylized facts on regional volatility. The initial step is to define a variable of interest and a way to measure its volatility.

In terms of the variable, we adopt employment data as it is commonly accepted in the literature (Carlino et al. 2013; 2003; Owyang et al. 2009). Other variables such as GDP, investment, consumption, GVA (Gross Value Added) etc. could also be possible candidates. However, the most available dataset at the regional level is the employment. Indeed, it is one of variables that follow a clear cyclical pattern which fits well.to our purposes.

In terms of the way how we measure the volatility, there are two main approaches developed in the literature; conditional and unconditional measure. To begin with the former, let x be a time series variable, then unconditional volatility is defined as the standard deviation (SD) of x over a certain period. (Owyang et al. 2008).

Second, there is a class of conditional volatility measures. There are actually two main types. The first one is adopted by Buch et al. (2004) and Carlino et al. (2003). So, if x follows a first-order autoregressive process;

$$x_t = \rho x_{t-1} + u_t \quad (1)$$

SD of errors (u) over time defines the conditional volatility of x over time. Another conditional measure is provided by Carlino et al (2013). They consider a panel setting in their study:

$$x_{i,t} = \mathrm{v}_0 + d_i + e_{i,t} \quad (2)$$

where $x_{i,t}$ is the variable for region i at year t and d represents the regional dummies. So, SD of errors ($e_{i,t}$) is the conditional volatility of region i over a period.

In this study, we prefer adopting the unconditional volatility since it is tractable and intuitive. We start our analysis by illustrating an initial picture of national employment cycle and its volatility over time.

However, we first need to estimate the employment cycle. In order to do so, we apply a Hodrick-Prescott (1997) (HP) filtering which is a tool used to estimate the long-run trend of the economy. Then, cycle is defined as the deviations of employment from this trend. Specifically, let y be the employment (in logs), the HP filter minimizes the following term with respect to long term trend (τ) (Hodrick-Prescott (1997); Duran, 2014):

$$\min \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2$$

(3)

The first component above represents the deviations of employment from its long term trend. Second component shows, instead, the degree of variability in trend over time. λ is the penaltly parameter which determines the smoothness of trend. We accept $\lambda = 100$ as suggested by Hodrick and Prescott (1997). Then, the employment cycle is defined as

$$empc_t = y_t - \tau_t \quad .$$

(4)

In Figure 1, we present the evolution of national employment cycle (*empc*) (in 1.a) and its volatility over time (in 1.b). (data obtained from TUIK).

(Figure 1 About Here)

The volatility has been calculated by using SD (standard deviation) of employment cycle over rolling windows of 5 year intervals. It has been clearly showed that volatility does not tend to increase or decrease over time but it rather exhibits alternating periods of ups and downs. So, one may argue that employment fluctuations are not moderated over time, in contrast to what is commonly observed in U.S and other countries. Rather, it tends to persists around a constant value. This shows once more the severity of volatility issue as a policy concern.

From a cross-regional viewpoint, our case is quite interesting. We demonstrate the regional variation of employment instability by calculating the SD of 26 Nuts-2 regions' employment cycles (HP) over a period 2004-2013. Table 1 summarizes the results.

(Table 1 About Here)

At a glance, we observe large differences across regions. For instance, the most volatile regions, TR82 (0,0522), TRC3 (0,0515) and TR71 (0,0289), have approximately 5-6 times larger instability than the least volatile regions; TR51(0,009), TR61(0,0094) and TR22 (0,0095). This has been demonstrated clearly in Figure 2 which depicts the evolution of employment cycles in most (2.a.) and least (2.b) volatile regions.

(Figure 2)

Moreover, in the last raws of Table 1, we calculate the summary statistics of regional volatilities. The cross-sectional mean value is 0,021, maximum value is 0,052, minimum value is 0,009 and SD is 0,011. SD/Mean is 0,52 which indicates a great heterogeneity across regions.

As a last fact, we demonstrate the geographical distribution of regional volatility in Figure 3. The dark (light) orange layers show relatively more (less) volatile regions.

(Figure 3)

From the map, it is not really clear to observe a distinct geographical pattern. Eastern parts, particularly South-Eastern regions and some middle Anatolian regions seem to exhibit a higher instability while 3 big metropolitan regions (izmir, Istanbul, Ankara), Black Sea coast and northern Aegean sea coastal regions are the most stable economies.
Nonetheless, a spatial correlation can be suspected. So, we have implemented a Moran I's test (although we do not report it here) and found no evidence of spatial autocorrelation in volatility patterns. That's why for the remaining parts of the paper, we do not consider this fact.

Overall, the message we convey in this part is the severity of volatility problem which ranges greatly across regions. Thus, there is an essential need for explanations on the reasons behind cross-sectional variation which is an issue to be covered in the next section.

4. Empirical Analysis: why some regions are more volatile?

4.1 Empirical Model and Results

The panel model we propose is represented by the following equation:

$$vol_{i,t} = \gamma + \beta_1 lpr_{i,t} + \beta_2 size_{i,t} + \beta_3 growth_{i,t} + \beta_4 growth_{i,t}^2 + \beta_5 herf_{i,t} + \beta_6 ind_{i,t} + \beta_7 agr_{i,t} + \beta_8 edu_{i,t} + \beta_9 fem_{i,t} + \beta_{10} sch_{i,t} + \beta_{11} un_{i,t} + \beta_{12} gdpshock_{i,t} + \beta_{13} intshock_{i,t} + exp_{i,t} + \beta_{16} imp_{i,t} + u_i \quad (5)$$

where *i* represents the 26 NUTS-2 regions and *t* represents the years between 2005 and 2013..

To start with the dependent variable, $vol_{i,t}$ is the volatility of region *i* at year *t* defined as the absolute value of HP de-trended employment:

$$vol_{i,t} = |empc_{i,t}|$$
(6)

In term of independent variables, the first one is labor participation rate *(lpr)* of the region which represents the share of active labor force within the total population of region. *size* denotes the market size of the region measured by the total number of employees above 15 years old (in logs). *growth* is the annual percentage increase in regional employment. A squared version of this variable has also been included to capture the nonlinear relationship. *herf* represents the herfindahl index of industrial specialization. Specifically, we calculate it in a following way:

$$herf_{i,t} = \sum_{n=1}^{3} \quad (s_{i,n,t})^2$$
(7)

s represents the share of sector *n* in total employment of region *i* at time *t.* We consider the three basic sectors; agriculture, industry and services. A high value of *herf* indicates a highly specialized employment structure whereas low *values i*mply industrial diversification. *ind* and *agr* variables indicate respectively the shares of industry and agriculture in total employment of the region. *edu* represents the education level of regions, measured by the percentage share of university graduates within the regional labor force. In a similar vein, *fem* measures the share of female population within the regional labor force.

sch represents the degree of change in industrial structure of the region. It has been computed in a following way (Trendle, 2006):

$$Sch_{i,t} = \frac{1}{2}\sum_{n=1} | s_{n,i,t} - s_{n,i,t-1}|$$
(8)

where sum of absolute yearly changes in sectoral shares have been calculated. High (low) values of *sch* denote a rapid (slow) transformation in regional industrial structure.

un is the unemployment rate of the region. *bsc* and *int* represent the two aggregate disturbances which are calculated in form of economic shock and using the following bivariate VAR model:

$$bsc_t = \gamma_0 + \gamma_1 bsc_{t-1} + \gamma_2 bsc_{t-2} + \gamma_3 bsc_{t-3} + \gamma_4 bsc_{t-4} + \gamma_5 int_{t-1} + \gamma_6 int_{t-2} + \gamma_7 int_{t-3} + \gamma_8 int_{t-4} + \mu_t \quad (9)$$

$int_t = \delta_0 + \delta_1 bsc_{t-1} + \delta_2 bsc_{t-2} + \delta_3 bsc_{t-3} + \delta_4 bsc_{t-4} + \delta_5 int_{t-1} + \delta_6 int_{t-2} + \delta_7 int_{t-3} + \delta_8 int_{t-4} + e_t$ (10)

Respectively, *bsc* and *int* are the HP de-trended quarterly national GDP and interest rates (1 year maturity) where as $gdpshock$ and $intshock$ are the variables used in regression. Specifically, they represent the shocks to *bsc* and *int* and are defined as the annualized and sum of absolute values of μ_t and e_t.

Finally, *exp* and *imp* represents the trade openness- export and import intensity- of the region, measured by the share of trade value (in dollars) in regional total employment, available only for a period of 2005-2012.

The regression model in equation 5 is initially estimated by ordinary least squares (OLS) technique. The results are summarized in table 2. In the estimation procedure, we first define a base model with 6 variables in the first column, then, add other variables one-by-one to check in this way the robustness of results with respect to the different regression specifications. Overall, we have 9 models.

(Table 2 About Here)

Looking at the entire results in Table 2, one of the most robustly evident variables is the regional rate of labor participation *(lpr)* which has a negative and significant coefficient in all models. It suggests that regions which have high participation to labor force, are likely to have more stable employment. In other words, rate of active labor force in a region is crucial for stability. Lack of participation can, indeed, be seen as a manifestation of the inadequacy in human capital investments (Fleisher and Rhodes, 1976; Elhorst, 2003; Ezcurra, 2010) . Thus, it represents higher risks of being laid off for workers which makes it more likely that workers have high job turnover and instable employment. (Fleisher and Rhodes, 1976; Elhorst, 2003; Ezcurra, 2010) .

Another important variable is the employment (market) size of region (*emp*) which has a negative and significant coefficient in all regressions. So, regions that have a larger market size and labor pool are likely to have more stable economies and milder fluctuations. This seems quite plausible as quicker job matches through the availability of many job offers and job seekers are provided in large market areas. (Elhorst, 2001, Trendle, 2006). In fact, these areas can easily absorb the economic shocks and are, therefore, likely to exhibit a more smoothed pattern of employment (Begovic, 1992; Tredle, 2006; Malizia and ke, 1993; Kort, 1981; Brewer and Moomaw, 1985).

Growth rate of the regions have also been found to play a crucial role. It has a negative and its square has a positive and significant coefficient. This means that the relationship between growth and volatility is U-Shaped. Such that the negatively growing regions (less than 0 % a year) experience normal levels of volatility; regions which have annual growth rates between 0- 10 % experience very low volatility; however, fast growing regions (i.e. more than 10 %) experience relatively higher volatilities. Hence, moderate growth rates are useful in enjoying the stability while extreme growth rates include instability in nature.

Another significant factor is the aggregate monetary shocks. Unexpectedly, the sign is negative which indicates the fact that regional employment volatility lowers in case of large unanticipated shocks to interest rates.

The remaining hypotheses are either weakly evident (herfindahl index) or non-robustly and partially evident.

Overall, one may argue that in contrast to conventional findings in the literature, in Turkey demographic and market size hypotheses, growth rate and related characteristics of the regions are influential in determination of cyclical instability of employment.

However, in our analysis, one technical concern regards the possibility of bias driven by OLS estimation that might have distorted the results due to a neglected indigeneity and unobserved heterogeneity in observations. These features can possibly be captured by Random or Fixed effect panel models which are commonly used in the literature (Baltagi, 2013).

Random effect models help capturing region or time specific effects and endogeneity by allowing for a randomly occurring unobserved heterogeneity in observations. Fixed effect models are instead useful in capturing the time-specific and-or region specific effects. In this way, it controls the unobserved heterogeneity across regions or years.

The preference between Random and Fixed effects models can be decided by a Hausman Test (Hausman, 1978) which is designed to determine whether

Ho: difference in coefficients are not systematic, Random Effects Model is appropriate
Ha: difference in coefficients are systematic, Fixed (Within) Effects Model is appropriate

In case Ho is true, random effect estimator is efficient and consistent while fixed effects model is consistent but inefficient. If Ha is true, fixed effect model is consistent but random effect model is inconsistent

We apply the test above on our base model and present the result in Table 3. It shows that the null hypothesis is accepted, which indicates the convenience of random effects model.

(Table 3)

Having understood this, we run the same model using a Generalized Least Squares (GLS) approach and a random effects model. The results are summarized in Table 4.

(Table 4)

At a Glance, it is clearly observable that almost the same story as in OLS results is played. So, share of active labor force and large market size are again the evident factors that help smoothing the regional employment fluctuations . Accordingly, the role of growth and monetary policy shocks are consistently evident as explained in OLS estimation.

Hence, one may consequently attempt to define a typically stable Turkish regional economy; as the ones which have a large labor pool with highly active labor force and experiencing moderate levels of growth rates. Accordingly, a relatively more volatile local economy is characterized by a small regional market with inactive labor force (like high share of students and retirees) and/or either negatively or very fast growing regions.

4.2 Sources of Regional Employment Shocks

We have learned in 4.1 that regional employment volatility is mostly related to the region-specific characteristics (like labor market participation; market size; growth) rather than industrial or aggregate factors. To be able to generalize this phenomenon, this section is devoted to decomposing the sources of regional employment fluctuations. In detail, we estimate the relative contribution of sectoral, aggregate and region specific disturbances to employment shocks of the region in a specific industry.

In order to do this, we follow the general procedure in the literature and adopt a (Vector Autoregression) VAR model (Sims, 1980; Todd, 1998; Filiztekin, 2004). However, our dataset is in a panel setting rather than a purely time series data. So, we adopt panel VAR model which is more interesting *per se* since it combines the cross sectional dimension with time series dimension. In addition, it has been known as a new technique in the literature. (Love and Zicchino, 2006)

Specifically, the model we propose takes the following form:

$$E_{r,j,t} = \omega_{11} + \omega_{12}E_{r,j,t-1} + \omega_{13}E_{t-1} + \omega_{14}E_{j,t-1} + \omega_{15}\, E_{r,t-1} + \beth_{r,j,t}$$
$$E_{t} = \omega_{21} + \omega_{22}E_{r,j,t-1} + \omega_{23}E_{t-1} + \omega_{24}E_{j,t-1} + \omega_{25}\, E_{r,t-1} + \aleph_{r,j,t}$$
$$E_{r,t} = \omega_{31} + \omega_{32}E_{r,j,t-1} + \omega_{33}E_{t-1} + \omega_{34}E_{j,t-1} + \omega_{35}\, E_{r,t-1} + \emptyset_{r,j,t}$$
$$E_{j,t} = \omega_{41} + \omega_{42}E_{r,j,t-1} + \omega_{43}E_{t-1} + \omega_{44}E_{j,t-1} + \omega_{45}\, E_{r,t-1} + \exists_{r,j,t}$$
(11)

where $E_{r,j,t}$ represents the annual employment growth (logged and first differenced) in sector j, in region r and at time t., E_t is the national employment growth at year t, $E_{r,t}$ is the employment growth in region r and $E_{j,t}$ is the nationwide employment growth of sector j.

Hence, E_t captures the aggregate employment shocks; $E_{r,t}$ captures the region specific shocks ; $E_{j,t}$ captures the nationwide-sector specific shocks and $E_{r,j,t}$ captures the region-specific sectoral shocks.

We consider three basic sectors; agriculture, industry and services. In terms of spatial units, there 26 Nuts-2 regions. The period of analysis runs from 2005 to 2013. Thus, we have 3x26x9 (702) observations.

We estimate the system in equations (11) and report the Cholesky Forecast Error Variance decompositions which help determining the percentage contribution of different sources of disturbances to $E_{r,j,t}$. However, Cholesky order specifications and orthogonalization of shocks are crucial matters which might significantly change the results. Therefore, we try with all possible combinations of cholesky orderings and report the results in Table 5. There are 6 different orders used; each of which is indicated at the bottom of each report. Just as an example of one of those orderings; "E_t, $E_{j,t}, E_{r,t}, E_{r,j,t}$" means that aggregate shocks affect nationwide-sector specific shocks that, in turn, affect the region specific shocks and which, finally, have an influence on regionwide-sectoral shocks.

(Table 5)

Looking at the results, regardless of which ordering has been adopted; the estimations indicate more or less the same result. So, in 10 year forecast horizon, only about 0-5 % of the shocks to $E_{r,j,t}$ is due to national shocks. Similarly, the contribution of nationwide-sectoral shocks is only about 2-6 %. In contrast, region specific disturbances (like $E_{r,t}$ and $E_{r,j,t}$) are much more important. Such that they cover about 93-97 % of the shocks to $E_{r,j,t.}$

Overall, It has once more been shown that in employment shocks and cyclical sensitivity, region's specific caractheristics are much more important than nationwide economic and pure sectoral circumstances. Thus, this analysis complements well the findings in 4.1.

4.3 Regional Volatility and Income Convergence

The final aim of our study is to investigate the role of "instability" in creating spatial and economic inequalities. In other words, our purpose, in this section, is to show whether "volatility" is a significant source of regional inequalities. If this happens to be the case, it will give us an important policy lesson that "volatility" is not only a undesired phenomenon *per se*, but it also represents a harmfull effect on backward regions, which, can hardly attract investments and, therefore, can not fulfill their potential for convergence.

So far, the literature on Turkish regions in this field has focused on tradititonal approaches like σ and β-convergence (Barro and Sala-i Martin, 1991;1992). The results, however, are far from a consensus. While a group of studies has found an evidence of declining disparities, a greater strand of scholars has reported either widenning or persistence of inequalities.

Some of the studies belonging to the former stream are, for instance, Yıldırım et al. (2009) who have reported declining pattern of spatial inequalities among NUTS-II or NUTS-I level regions over the period 1987-2001; Kılıcaslan and Ozatagan (2007) who have found converging patterns of (64) provincial per capita incomes over the period 1987-2000.

Several example studies that belong to the latter strand are Filiztekin (1999) who has analyzed the convergence patterns among Turkish provinces from 1975 to 1995 and reported evidence of territorial polarization of income which is termed as “club convergence”; Karaca (2004) and Kırdar and Sirinoglu (2007; 2008) who have found income divergence among 67 provinces over the period 1975-2000; Gezici and Hewings (2007) who have reported evidence of increasing regional disparities over a period 1980-1997.

With regard to the economic reasons behind the spatial inequalities, a number of factors have been discussed. Most commonly, economic liberalization process since 1980 and related policies have been argued to induce the spatial inequalities by favoring the already developed metropolitan areas (i.e. Financial Centers) and leaving the backward regions underdeveloped(Gezici and Hewings, 2007, Yıldırım et al. 2009, Yıldırım and Ocal, 2006; Karaca, 2004; Filiztekin, 1999.). Another political factor regards the development strategy of government. Since the 1960s, the main policy instrument of government is the 5 year development plans which are often criticisized to be inefficient in maintaining social and territorial cohesion.

Outmigration of labor from underdeveloped areas to the developed ones are suggested as another factor since the lagging regions loose in this way their human capital base (Kırdar and Sirinoglu (2008)).

Other structural problems like inadequacy of physical and social capital, lack of infrastructure, innovation, entrepreneurship and financial deepness of poor regions are referred to as other important reasons for observed inequalities. (Gezici and Hewings, 2007, Yıldırım et al. 2006;2009, Karaca, 2004; Filiztekin, 1999).

In anycase, the literature in this field has largely ignored economic “instability” as a source of regional disparities. The rationale behind this claim is as follows; it is generally harder for volatile economies to attract endured and long-run investors as they search for political and economic stability (i.e. price stability). In other words, uncertainty in economic climate often frighten the investors.

To be able to analyze this issue empirically, as a first step, we depict in figure 4 the evolution of regional income distribution with a Kernel density distribution of per capita regional GVA values in initial (2004) and end year (2011) (Kernel). The values are in relative form. Thus, regions which have income above 1 (which represents the national average) are relatively wealthier

(Figure 4)

In 2004, we observe a bi-modal income distribution. The probability mass is concentrated on two modes; one of them is about the value (0.8) around which poorer countries have accumulated and the other is the club for wealthier areas (probability mass about 1.6).

Looking at the 2011 figure, the picture seems almost the same, with the only exception of an increased concentration of mass about 0.8-0.9 which indicates a slight reduction of inequalities. So, one may, consequently, argue that the regional inequalities tend to persist and do not shrink or enlarge over time. This shows once more the severity of the inequality problem.

Second type of analysis we pursue helps determine the role of volatility in creation of inequalities. To pursue such an analysis, we first follow a non-parametric approach as in Figure 5 and estimate a Conditional Kernel Density Estimation. Specifically, the relative income distribution (average of 2004-2011 years) has been conditioned on "volatility" variable which is defined as standard deviation of regional employment cycles (HP) over a period 2004-2013. The result is shown in Figure 5.

(Figure 5)

It is clearly seen that for low volatile regions (where the volatility value is about 0.01), high relative income is observed whereas for very highly volatile regions, relative income is below the national average. Hence, poorer areas are characterized by high volatility while rich regions enjoy the stability.

Second analysis finalizes our empirical investigation. We refer to the following conventional convergence equation but add the volatility variable as an explanatory fact. The model proposed takes the following form:

$$\log\left(\frac{y_{2011,i}}{y_{2004,i}}\right) = \partial_0 + \partial_1 \log(y_{2004,i}) + \partial_2 stab_i + \partial_3 stab_i x \log(y_{2004,i}) + \partial_4 edu_i + \partial_5 agr_i + \partial_6 \log\_labor_i + \exists_i$$

The dependent variable is the growth rate of per capita GVA *(y)* (logged and first differenced) over a period 2004-2011. i denotes the NUTS-2 regions. The first independent variables is the initial income of regions; $\log(y_{2004,i})$ The second one is the employment stability of regions (denoted with *stab*) which is measured by multiplying volatility by " -1" whereas volatility is defined as SD of regional employment HP cycles over 2004-2013 period.

Then, we also add an interaction variable between initial income and stability. The remaining control variables are first edu which represents the education level of regions in 2005, measured by the percentage share of university graduates within the regional labor force, second agr that is the employment share of agriculture sector in 2004; finally, $\ln\_labor_i$ is the log of regional populations in 2004.

(Table 6 About Here)

We estimate the regression above using OLS and present the results in Table 6. We use 6 different specifications to check the robustness of results with respect to several forms. The estimations indicate two major findings. First, initial income is significant only in 3 regressions and with a weak level of significance. The sign of its coefficient, in fact, switches from (+) to (-) (or vice versa) across regressions. Hence, initial income variable is not robustly significant. This indicates the fact that neither convergence of divergence pattern is observed which is a result totally consistent with previous findings.

Second, interaction variable between initial income and stability has a positive and significant coefficient in all regressions. This is a quite important result. It means that poorer and instable regions tend to grow slower than the richer ones which is a fact that contributes to the widening of regional disparities. Therefore, instability, that is generally experienced by poorer regions, has a detrimental effect on potential convergence, due to the fact that "instable" regions can hardly attract new and long-term direct investments as the economic climate in those regions includes large uncertainties.

The unconditional stability variable has a negative and significant coefficient. Finally, apart from agriculture variable which has a positive and significant coefficient, other control variables are insignificant.

Conclusions

This study has investigated several important issues on regional employment volatility in Turkey over a period 2004-2013. Specifically, we first analyzed the socio-economic determinants behind the cross regional variation of employment volatility; second, we have tried to generalize the sources of regional economic shocks and, lastly, we investigated the link between regional inequalities and volatility.

Our analyses indicate three major results. First, there are huge differences across regions in employment volatility. Such that the most instable region has almost 5 times more volatile employment pattern than the most stable region.

Second, volatility of regions is mostly related to demographic and market size characteristics of the regions and economic growth. Regions which have high rate of labor market participation (with active labor force) and moderated growth rates; the ones which constitute greater market area and labor pool tend to experience relatively more smoothed employment pattern and, thus, enjoy a stable economy. Indeed, in support of this finding, we have shown that regional economic shocks are mostly driven by region specific disturbances rather than purely nationwide or sectoral shocks.

Third, instability is found as an important barrier against income convergence and territorial cohesion. It has been shown that relatively wealthier regions are the ones which enjoy the stability and grow faster than the poorer ones.

In the light of these results, the most important lesson we get is a political message; not only economic growth is important for achievement of territorial cohesion but also short-term instability in underdeveloped areas is a crucial matter that should be addressed by policy makers

References

Attaran M. 1986. Industrial diversity and economic performance in US areas. Annals of Regional Science, 20:44–54

Baldwin J. and Brown W. 2004. Regional manufacturing employment volatility in Canada: The effects of specialisation and trade, *Papers in Regional Science*, 83(3): 519-541.

Barro, R. J., Sala-i-Martin, X. 1992. *Convergence. Journal of Political Economy.* 100(2): 223-51

Barro R.J., Sala-i Martin X. 1991. Convergence across States and Regions. *Brookings Papers on Economic Activity*. 22(1): 107-182.

Begovic B. 1992. Industrial diversification and city size: the case of Yugoslavia. *Urban Studies*, 29 (1):77–88

Berument M.H., Dinçer N.N. and Mustafaoğlu Z. 2011. Effects of growth volatility on economic performance – Empirical evidence from Turkey, *European Journal of Operational Research (*217): 351–356

Blanchard O. And Simon J. 2001. The Long and Large Decline in U.S. Output Volatility, *Brookings Papers on Economic Activity*, (1):135-173

Baltagi H. 2013. Econometric Analysis of Panel Data, 5th Edition, Wiley Blackwell

Boivin, J. and Giannoni, M. P. 2006. Has monetary policy become more effective*? Review of Economics and Statistics 88* (3): 445–462

Brewer H.L, Moomaw R.L. 1985. A note on population size, industrial diversification and regional economic instability. *Urban Studies*, (22):349–354

Buch C.M., Doepke J. and Pierdzioch C. 2004. Business Cycle Volatility in Germany, *German Economic Review,* 5(4): 451–479

Buch C.M. and Scholetter M. 2013. Regional origins of employment volatility: evidence from German states, *Empirica*, 40: 1-19

Carlino G., Defina R. and Sill K. 2003. Post War Changes in Employment Volatility: New Evidence From State/Industry PanelData, Growth Volatility *NBER Working Paper no. 03-18.*

Carlino G., Defina R. and Sill K. 2013. The Long and Large Decline in State Employment Growth Volatility, *Journal of Money, Credit and Banking,* 45 (2-3): 521-534.

Chauvet M. and Potter S. 2001. Recent changes in the U.S. business cycle, Staff Reports 126, Federal Reserve Bank of New York.

Dissart C.J. 2003. Regional Economic Diversity and Regional Economic Stability: Research Results and Agenda, International Regional Science Review, 26(4): 423–446.

Duran E. H. 2014. Short run dynamics of income disparities and regional cycle synchronization in the U.S, Growth and Change, 45(2): 292–332

Dynan, K. E., Elmendorf, D. W. and Sichel, D. E. 2006. Can financial innovation help to explain the reduced volatility of economic activity? *Journal of Monetary Economics* 53(1): 123–150

Hakura D. 2007. Output Volatility and Large Output Drops in Emerging Market and Developing Countries," IMF Working Papers 07/114, International Monetary Fund.

Hausman, J. A. 1978. Specification Tests in Econometrics". Econometrica 46(6): 1251–1271

Hodrick, R. and Prescott, E.C. 1997. Postwar US Business Cycles: An Empirical Investigation. *Journal of Money, Credit and Banking* 29(1), 1–16.

Elhorst J. P. 2001. The Mystery of Regional Unemployment Differentials: A Survey of Theoretical and Empirical Explanations. Research Report Number 00C06. Research Institute SOM (Systems, Organisations and Management), University of Groningen, Groningen.

Elhorst J. P. 2003. The mystery of regional unemployment differentials: a survey of theoretical and empirical explanations, *Journal of Economic Surveys* 17, 709–748.

Ezcurra R. 2010. Unemployment Volatility and Regional Specialization in the European Union, *Regional Studies,* 45(8): 1121–1137

Filiztekin A. 1999. Convergence Across Turkish Provinces and Sectoral Dynamics?, Koc University *mimeo.*

Filiztekin A. 2004. Bölgesel büyüme, eş-hareketlilik ve sektörel yapı, *Türkiye Ekonomi Kurumu Tartışma Metni 2012/61*

Fleisher, B.M. and Rhodes, G. 1976. Unemployment and the Labor Force Participation of Married Men and Women: A Simultaneous Model, *The Review of Economics and Statistics,* 58(4): 398-406

Fujita M., Krugman P. and Venables A. J. 1999. The Spatial Economy: Cities, Regions and International Trade. MIT Press, Cambridge, MA.

Gezici, F. Hewings, G. 2004. Regional Convergence and the Economic Performance of Peripheral Areas in Turkey, Review of Urban and Regional Development Studies, 16(2): 113-133

Gezici F. And Hewings G. 2007. Spatial Analysis of Regional Inequalities in Turkey, *European Planning Studies*,. 15(3): 383-403

Jackson, RandallW. 1984. An evaluation of alternative measures of regional industrial diversification, *Regional Studies* 18: 103-12.

Jaimovich, Nir, and Henry E. Siu. 2009. The Young, the Old, and the Restless: Demographics and Business Cycle Volatility. *American Economic Review*, 99(3): 804-26.

Kahn, J. A., McConnell, M. M., Perez-Quiros, G. 2002. On the causes of the increased stability of the U.S. economy. *Federal Reserve Bank of NewYork Economic Policy Review* 8 (1), 183–202.

Kangasharju A. and Pekkala S. 2004. Increasing Regional Disparities in the 1990s: The Finnish Experience, *Regional Studies*, Taylor & Francis Journals, 38(3): 255-267.

Karaca O. 2004. Türkiye'de bölgeler arası gelir farklılıkları: yakınsama var mı?, Türkiye Ekonomi Kurumu tartışma metni 2004/7

Kent C., Smith K. and Holloway J. 2005. Declining Output Volatility: What Role for Structural Change?, Research Discussion Paper 2005-08, Reserve Bank of Australia

Kılıcaslan Y. and Ozatagan G. 2007. Impact of Relative Population Change on Regional Income Convergence: Evidence from Turkey, *Review of Urban and Regional Development Studies,* 19 (3): 210-223.

Kırdar M. and Saracoğlu S. 2008. Migration and regional convergence: An empirical investigation for Turkey," *Papers in Regional Science*, 87(4): 545-566

Kirdar, M. and Saracoglu, S. 2007. Migration and Regional Convergence: An Empirical Investigation for Turkey, MPRA Paper 2648, University Library of Munich, Germany.

Kim, C.J. and Nelson C. R. 1999. Has the U.S. Economy Become More Stable? A Bayesian Approach Based on a Markov-Switching Model of the Business Cycle, *The Review of Economics and Statistics,* 81 (4): 608-616

Kort J. 1981. Regional economic instability and industrial diversification in the US. *Land* Economics (57):596–608.

Le A.T. and Miller P.W. 2000. Poor quality jobs: do they lead to churning. In: John Mangan (ed) Understanding and reducing unemployment: national and state perspectives. Office ofEconomic and Statistical Research, Queensland Treasury, Brisbane

Love, I. and Zicchino, L. 2006. Financial development and dynamic investment behavior: Evidence from panel VAR, *The Quarterly Review of Economics and Finance,* 46(2): 190-210

Malizia E.E. and Ke S. 1993. The influence of economic diversity on employment and stability. *Journal of Regional Science* 33(2):221–235

McConnell M. M. and Quiros G.P. 2000. Output Fluctuations in the United States: What Has Changed Since the Early 1980s?, Federal Reserve Bank of New York Working Paper

Owyang M.T., Piger J. and Wall H.J. 2008. A state-level analysis of the Great Moderation, *Regional Science and Urban Economics (*38): 578–589

Owyang, M. T. And Wall, H. J. 2009. Regional VARs and the channels of monetary policy. *Applied Economics Letters,* 16(12): 1191-1194.

Rodriquez-Pose, R., and U. Fratesi. 2007. Regional business cycles and the emergence of sheltered economies in the southern periphery of Europe. *Growth and Change (*38): 621–648.

Richardson, H. W. 1969. Regional Economics. New York: Praeger.

Rodgers, Allan. 1957. "Some Aspects of Industrial Diversificationin the United States.*Economic Geography* 33: 16-30.

Schoenning N. C. and Sweeney L. E. 1992. Proactive industrial development strategies and portfolio analysis, *Review of Regional Studies* (22): 227–238.

Siegel P, Alwang J, Johnson T. 1995. A structural decomposition of regional economic instability: a conceptual framework, *Journal of Regional Science*, 35(3):457–470.

Simon CJ, Nardelli C (1992) Does industrial diversity always reduce unemployment? Evidence from the great depression and after. *Economic Inquiry*, 30(2):384–397

Simon, J. 2001. The Decline in Australian Output Volatility', Research Discussion Paper No. 2001-01, Reserve Bank of Australia.

Sims, C. A, 1980. Comparison of Interwar and Postwar Business Cycles: Monetarism Reconsidered, *American Economic Review,* 70(2): 250-57.

Smith S. and Gibson C. 1988. Industrial diversification in nonmetropolitan counties and its effect on economic stability. Western Journal of Agricultural Economics, 13(2):193–201

Stock J.H. and Watson M. W. 2003. Has the Business Cycle Changed and Why?," NBER Chapters, in: NBER Macroeconomics Annual 2002, Volume 17, pages 159-230 National Bureau of Economic Research, Inc.

Wagner J.E. 2000. Regional economic instability: action, concept, or state of confusion. *Journal of Regional Analysis and Policy*, 30(2):1–21

Taylor, J. 1999. An Historical Analysis of Monetary Policy Rules', in: J. Taylor (ed.), Monetary Policy Rules, University of Chicago Press.

Thompson, W. R. 1965. A Preface to Urban Economics. Baltimore:Johns HopkinsU niversity Press.

Todd C.E. 1998. Employment Fluctuations in U.S. Regions and Industries: The Roles of National, Region-Specific, and Industry-Specific Shocks, *Journal of Labor Economics,*. 16(1): 202-29.

Trendle B. 2006. Regional economic instability: the role of industrial diversification and spatial spillovers, *Annals Regional Science*, (40):767–778

Wayslenko, Erikson (1978) On measuring economic diversification: comment. *Land Economics*, 54 (1):106–110

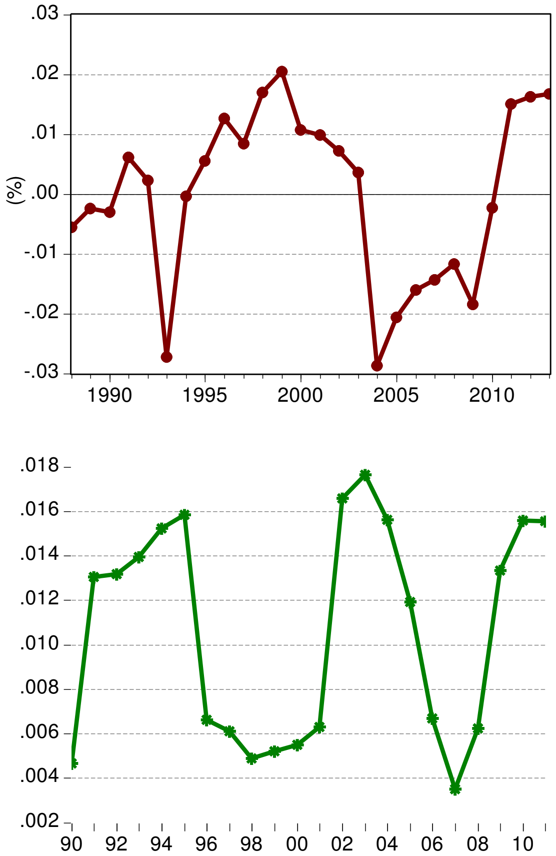
Wundt B. 1992. Reevaluating alternative measures of industrial diversity as indicators of regional cyclical variations. *Review of Regional Studies*, 22(1):59–73

Yildirim J., Ocal N., Ozyildirim S. 2009. Income inequality and economic convergence in Turkey: A spatial effect analysis. *International Regional Science Review* 32(2), 221-254

Yıldırım J. and Öcal N. 2006. Income Inequality and Economic Convergence in Turkey, *Transition Studies Review,* 13(3): 559-568

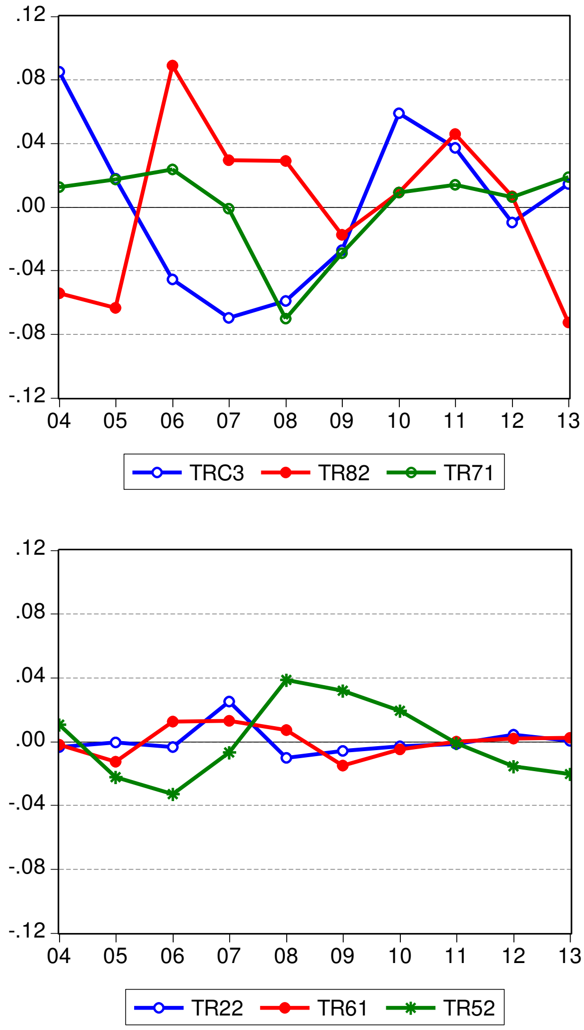
Zarnowitz, V. and G. H. Moore. 1986. Major Changes in Cyclical Behavior', in: R. J. Gordon (ed.), The American Business Cycle: Continuity and Change, National Bureau of Economic Research Conference on Research in Business Cycles, University of Chicago Press, Chicago, pp. 519–572

Figures



(1.a) (1.b)

Fig 1. (1. a) National HP Employment cycles 1988-2013 (data source: TUIK) (1.b) Evolution of employment volatility (SD of) over 5 year intervals, midpoints are presented. 1990 represents the volatility in 1988-1992 period.



2.a Most Volatile Regions 2.b Least Volatile Regions

Fig. 2 Most and Least Volatile Regions, Hodrick-Prescott employment cycles are shown 2004-2013,

High Volatility	[0.052,0.241]	
Medium Volatility	(0.241,0.0153]	
Low Volatility	(0.0153,0.009]	

Fig. 3 Geographical Distribution of employment volatility

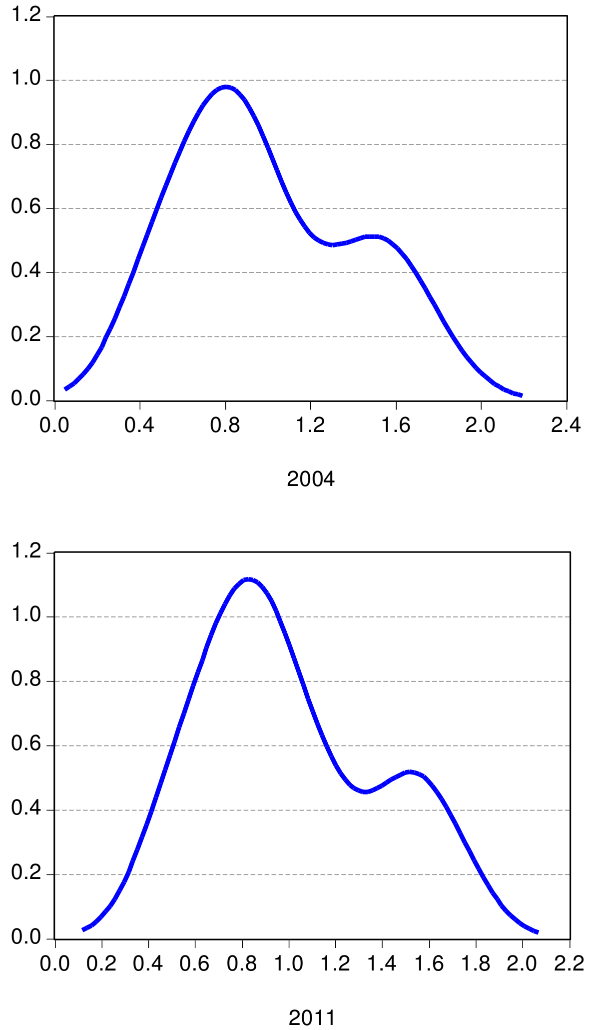


Fig 4. Relative Income Distribution in 2004 and 2011, GVA per capita and Kernel Density used.,

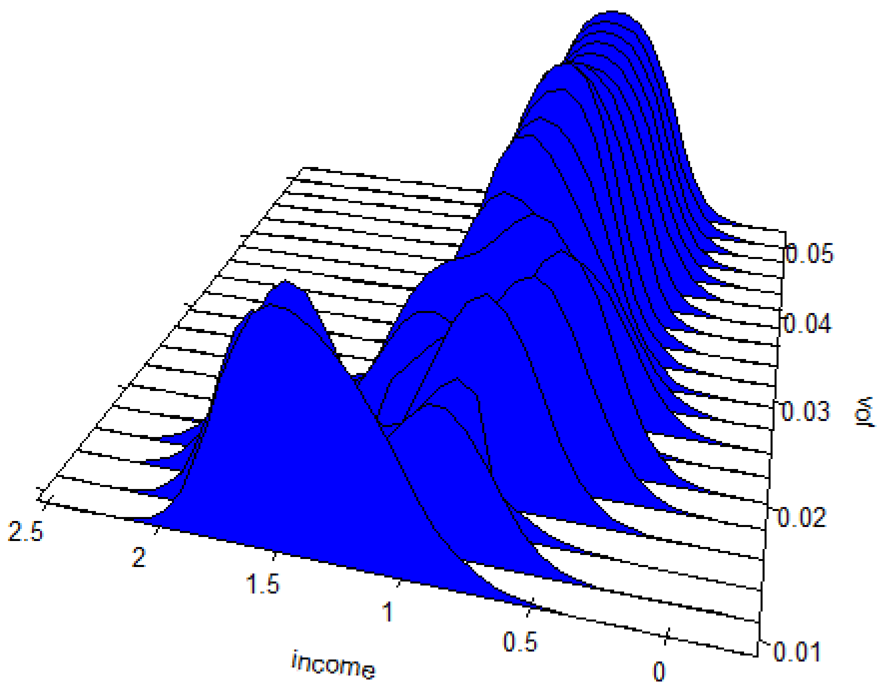


Fig. 5. Conditional Distribution of income on volatility

Tables

Table 1. Regional Economic Volatility Statistics 2004-2013

Region	Volatility	Region	Volatility
TR10	0,0147	TR71	0,0289
TR21	0,0125	TR72	0,0263
TR22	0,0095	TR81	0,0211
TR31	0,0135	TR82	0,0522
TR32	0,0235	TR83	0,0134
TR33	0,0284	TR90	0,0118
TR41	0,0154	TRA1	0,0283
TR42	0,0110	TRA2	0,0206
TR51	0,0090	TRB1	0,0156
TR52	0,0242	TRB2	0,0256
TR61	0,0094	TRC1	0,0229
TR62	0,0153	TRC2	0,0288
TR63	0,0220	TRC3	0,0515
Max	0,052187		
Min	0,009023		
Mean	0,021375		
SD	0,01116		
SD/Mean	0,522078		

Table 2. Panel regression results, OLS

OLS	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9
constant	0,0772***	0,0769***	0,0788***	0,0834***	0,0807***	0,0705***	0,0691***	0,0742***	0,0878***
lpr	-0,0006***	-0,0006***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***
emp	-0,0088*	-0,0087*	-0,0086*	-0,0088*	-0,0083	-0,0081	-0,0082	-0,0080	-0,0089
growth	-0,0380*	-0,0380*	-0,0384*	-0,0377*	-0,0349	-0,0384*	-0,0403*	-0,0414*	-0,0297
growth_sq	0,3961***	0,3959***	0,3965***	0,3943***	0,3796***	0,3879***	0,3944***	0,3940***	0,3472***
herf	-0,0176	-0,0174	-0,0129	-0,0135	-0,0135	-0,0124	-0,0133	-0,0156	-0,0236
ind	-0,0043	-0,0039	-0,0111	-0,0148	-0,0143	-0,0080	-0,0081	-0,0078	-0,0259
agr		0,0003	-0,0102	-0,0124	-0,0118	-0,0024	-0,0023	-0,0027	-0,0059
edu			-0,0283	-0,0292	-0,0279	-0,0166	-0,0148	-0,0116	-0,0163
fem				-0,0066	-0,0065	-0,0076	-0,0070	-0,0052	-0,0081
sch					0,0164	0,0149	0,0095	0,0133	0,0220
un						0,0003	0,0003	0,0002	0,0002
gdpshock							0,0766	0,0651	0,0461
intshock								-0,0668*	-0,0929**
exp									0,0000
imp									0,0000
N	234	234	234	234	234	234	234	234	208
R_Squared	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.39
F	20.98***	18.79***	16.42***	14.07***	13.17***	12.28***	11.46***	11.59***	20.49***

Notes: ***; significance at 1 %, ** at 5 %, * at 10 %. Robust Standard Errors are used. id: number of cross sectional units, N: number of observations.

Table 3 Hausman Test on Base model

	values
Chi Square test Statistics	0.92
P-Value	0.99

Table 4. Panel regression results, Random Effects

Random Effects	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9
constant	0,0776***	0,0785***	0,0799***	0,0845***	0,0807***	0,0705***	0,0691***	0,0742***	0,0878***
lpr	-0,0006***	-0,0006***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***	-0,0005***
emp	-0,0088*	-0,0089*	-0,0087*	-0,0089*	-0,0083*	-0,0081*	-0,0082*	-0,0080*	-0,0089
growth	-0,0368***	-0,0363**	-0,0371***	-0,0363**	-0,0349**	-0,0384**	-0,0403**	-0,0414**	-0,0297*
growth_sq	0,3897***	0,3867***	0,3893***	0,3863***	0,3796***	0,3879***	0,3944***	0,3940***	0,3471***
herf	-0,0180	-0,0187	-0,0141	-0,0150	-0,0135	-0,0124	-0,0133	-0,0156	-0,0236
ind	-0,0046	-0,0055	-0,0123	-0,0159	-0,0143	-0,0080	-0,0081	-0,0078	-0,0259
agr		-0,0007	-0,0107	-0,0128	-0,0118	-0,0024	-0,0023	-0,0027	-0,0059
edu			-0,0275	-0,0280	-0,0279	-0,0166	-0,0148	-0,0116	-0,0162
fem				-0,0065	-0,0065	-0,0076	-0,0070	-0,0052	-0,0081
sch					0,0164	0,0149	0,0095	0,0133	0,0219
un						0,0003	0,0003	0,0002	0,0002
gdpshock							0,0766	0,0651	0,0461
intshock								-0,0668*	-0,0928**
exp									0,0000
imp									0,0000
N	234	234	234	234	234	234	234	234	208
R_Squared	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.39
Wald	119,99***	116,85***	119,31***	118.54***	125.22***	126.19***	126.75***	130.46***	120.24***

Notes: ***; significance at 1 %, ** at 5 %, * at 10 %. id: number of cross sectional units, N: number of observations.

Tablo 5. Panel VAR Results , Cholesky Variance decompositions, % of shocks explained

Periods	EJ	ER	ERJT	ET
1	1,73	17,90	75,88	4,49
2	2,25	17,56	75,77	4,41
3	2,32	17,55	75,70	4,43
4	2,33	17,54	75,69	4,43
5	2,33	17,54	75,69	4,43
6	2,33	17,54	75,69	4,43
7	2,33	17,54	75,69	4,43
8	2,33	17,54	75,69	4,43
9	2,33	17,54	75,69	4,43
10	2,33	17,54	75,69	4,43

Cholesky Ordering: $E_t,\ E_{j,t}, E_{r,t}, E_{r,j,t}$

Periods	EJ	ER	ERJT	ET
1,00	5,85	17,90	75,88	0,37
2,00	5,99	17,56	75,77	0,68
3,00	5,99	17,55	75,70	0,76
4,00	5,99	17,54	75,69	0,77
5,00	5,99	17,54	75,69	0,78
6,00	5,99	17,54	75,69	0,78
7,00	5,99	17,54	75,69	0,78
8,00	5,99	17,54	75,69	0,78
9,00	5,99	17,54	75,69	0,78
10,00	5,99	17,54	75,69	0,78

Cholesky Ordering: $E_{j,t},\ E_t, E_{r,t}, E_{r,j,t}$

Periods	EJ	ER	ERJT	ET
1	1,69	17,94	75,88	4,49
2	2,21	17,60	75,77	4,41
3	2,29	17,59	75,70	4,43
4	2,29	17,58	75,69	4,43
5	2,29	17,58	75,69	4,43
6	2,29	17,58	75,69	4,43
7	2,29	17,58	75,69	4,43
8	2,29	17,58	75,69	4,43
9	2,29	17,58	75,69	4,43
10	2,29	17,58	75,69	4,43

Cholesky Ordering: $E_t,\ E_{r,t}, E_{j,t}, E_{r,j,t}$

Periods	EJ	ER	ERJT	ET
1,00	5,85	18,21	75,88	0,06
2,00	5,99	17,88	75,77	0,37
3,00	5,99	17,87	75,70	0,44
4,00	5,99	17,87	75,69	0,45
5,00	5,99	17,87	75,69	0,45
6,00	5,99	17,87	75,69	0,45
7,00	5,99	17,87	75,69	0,45
8,00	5,99	17,87	75,69	0,45
9,00	5,99	17,87	75,69	0,45
10,00	5,99	17,87	75,69	0,45

Cholesky Ordering: $E_{j,t},\ E_{r,t}, E_t, E_{r,j,t}$

Periods	EJ	ER	ERJT	ET
1	1,69	21,66	75,88	0,77
2	2,21	21,26	75,77	0,76
3	2,29	21,24	75,70	0,77
4	2,29	21,24	75,69	0,78
5	2,29	21,24	75,69	0,78
6	2,29	21,24	75,69	0,78
7	2,29	21,24	75,69	0,78
8	2,29	21,24	75,69	0,78
9	2,29	21,24	75,69	0,78
10	2,29	21,24	75,69	0,78

Cholesky Ordering: $E_{r,t},\ E_t, E_{j,t}, E_{r,j,t}$

Periods	EJ	ER	ERJT	ET
1,00	2,40	21,66	75,88	0,06
2,00	2,61	21,26	75,77	0,37
3,00	2,62	21,24	75,70	0,44
4,00	2,62	21,24	75,69	0,45
5,00	2,62	21,24	75,69	0,45
6,00	2,62	21,24	75,69	0,45
7,00	2,62	21,24	75,69	0,45
8,00	2,62	21,24	75,69	0,45
9,00	2,62	21,24	75,69	0,45
10,00	2,62	21,24	75,69	0,45

Cholesky Ordering: $E_{r,t},\ E_{j,t}, E_t, E_{r,j,t}$

Table 6. Regression results, volatility and convergence

Variables	*model 1*	*model 2*	*model 3*	*model 4*	*model 5*	*model 6*
constant	0,789***	-0,006	-0,414	-0,152	0,010	-0,387
$\log(y_{2004,i})$	-0,121***	0,092	0,192**	0,136	0,074	0,164*
stab		-39,338***	-46,676***	-43,186***	-38,029***	-44,494***
*stab**$\log(y_{2004,i})$		10,679***	12,648***	11,721***	10,282***	12,000***
agr			0,088**			0,096**
edu				-0,169		0,051
Log_labor					0,018	0,023
R_Squared	*0,32*	*0,61*	*0,69*	0,62	0,62	0,7
White (F-Stat)	2,55	0,58	0,78	0,77	0,52	1,09
BP-LM(F-stat)	0,03	0,034	2,18	0,39	0,081	2,02
Jarque-Bera	4,03	0,26	0,11	0,057	0,29	0,26

Notes: ***; significance at 1 %, ** at 5 %, * at 10 %.