REGIONAL UNEMPLOYMENT DYNAMICS IN TURKEY

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Abstract
Aim of the study is to investigate region specific causes of unemployment for Turkish 26 Nuts-2 regions between 2004-2017. We aim at contributing to the literature by analyzing (i) whether regional unemployment and sub-groups (with respect to gender, age, education) is driven by excessive labor supply or shortage of labor demand, (ii) which sub-groups have higher unemployment in regions. In terms of methodology, we employ descriptive and exploratory analyses, spatial tests and panel regressions. Our findings indicate three main results: First, there is a sizable difference in unemployment rates across regions and the dispersion is getting stronger over time. Second, there are extremely low and high unemployment rates in various sub-groups and regions. Third, changes in unemployment is mostly driven by changes in labor supply rather than demand. Among the 208 cases (26 regions x 8 sub-groups), in 154 cases, the major driver of unemployment is the excessive labor supply.

Keywords: Regional Unemployment, Labor Supply, Panel Data Regression
JEL classification: R11, R23, R12

1. Introduction

In the literature on unemployment, regional dimension has largely been ignored by scholars. Compared to country level studies, far little emphasis has been put on the regional unemployment problem.

However, it represents a quite important issue not only from a research point of view but also from a policy stand point. High unemployment in regions is likely to make these places even more depressed and hamper its potential for convergence to the developed regions. Moreover, labor base in these places become unutilized, discouraged and remain idle. So, the level of productivity is adversely affected. Another important problem is the unemployment disparities across regions. High level of dispersion might trigger massive migration from backward regions to the developed ones which might bring many social and economic problems as a side effect.

Majority of scholars working in this field, has focused on two main topics. The first topic is whether or not the regional unemployment rates will tend to converge each other. There are three main hypotheses developed in this field. The first one is the convergence hypothesis. It claims that given the wages and labor are totally flexible and economic shocks are transitory, each region will absorb shocks easily and adjust quickly to a unique long-run equilibrium (Baddaley, Martin and Tyler, 1998; Filiztekin, 2009; Gözgör, 2012). Hence, at the equilibrium each region will have same level of unemployment rate. In this context, labor mobility plays a role as a spatially equilibrating mechanism which is likely to move from regions which have high unemployment rate to the ones which have low unemployment rates, eliminating, consequently the unemployment differences. (Haris and Todoro, 1970; Treyz et al. 1993).

There are, however, two contrasting hypotheses, which claims the persistence of unemployment disparities. The first one predicts no convergence to an equilibrium due to labor market rigidities and imperfections and the second one predicts the convergence of regions to different equilibria due to structural local differences. (Wedder and Gallaway; 1996; Filiztekin, 2009; Gözgör , 2012; Baddaley, Martin and Tyler, 1998; Dixon and Thrilwall, 1976, Wandercamp, 1989; Armstrong and Taylor, 1993 ; Pehkonen and Tervo, 1998).

Second strand of studies in this field has focused on cross regional variation in unemployment and determinants behind. Differences in demographic structure, industrial composition, migration patterns, wage setting mechanisms and natural amenities are discussed as the most dominant determinants. (Filiztekin, 2009; Burridge and Gordon, 1981; Siegers, 1983; Holzer, 1993; Elhorst, 2003; Badinger and Url, 2002).

With regard to the purpose of our study, we argue that the existing literature falls short from explaining several aspects, particularly region specific causes of unemployment. There is a need for more detailed and in dept analyses of the following questions which have not yet been adequately covered i.Which subgroups (with respect to gender, age and education) display a higher unemployment rate? ii. Does the change in unemployment mostly due to excess labor demand or supply? iii. In which regions and sub-groups changes in labor demand/supply is more dominant?

We try to investigate the questions above for 26 Turkish Nut-2 regions and a period 2004-2017. In terms of methodology, we use several descriptive and explorative statistics, Kernel density estimates, Spatial dependence tests and panel data regressions.

Organization of the paper is as follows. In section 2, we provide a detailed account of the existing theoretical and empirical literature. In section 3, we implement our empirical analyses by using statistical methodologies. Finally, in section 4, we conclude our study.

2. Literature Review

The literature on regional unemployment problem has focused on two main topics; (i) Whether regional unemployment rates will converge to each other, (ii) Reasons of why some regions have higher unemployment rates than others. For both questions, we provide a discussion below including theoretical arguments and empirical findings.

2.1. Literature on the Regional Unemployment Convergence

2.1.1. Theoretical Arguments

Three main hypotheses have been developed on the tendency of regional unemployment rates to convergence.

Hypothesis 1. Equilibrium and Convergence

In the general functioning of local labor markets, labor demand and supply interact via a wage setting mechanism. Equilibrium rate of unemployment is determined by these market forces (Filiztekin, 2009; Gözgör, 2012, Baddaley, Martin and Tyler, 1998)). If shocks to labor market are transitory, fluctuations will only be temporary and around natural unemployment rate. Given that the wages and labor are totally flexible and economic shocks are transitory, each region will absorb shocks easily and adjust quickly to an equilibrium (Filiztekin, 2009; Gözgör, 2012, Baddaley, Martin and Tyler ,1998)

Under these conditions, labor mobility plays a role as a spatially equilibrating mechanism. Such that labor is likely to move from regions which have high unemployment rate to the ones which have low unemployment rates (Haris and Todoro, 1970; Treyz et al., 1993). Hence, each region will converge to a unique long-run steady state equilibrium at which unemployment disparities across regions will totally be eliminated. This view is in line with the Classical/Neo-Classical perspective. (Filiztekin, 2009; Gözgör, 2012; Baddaley, Martin and Tyler,1998)

Hypothesis 2. Equilibrium but no convergence

Under this hypothesis, it is claimed that even though the labor and wages are completely flexible, each region might approach to a different long run equilibrium and unemployment rate. (Wedder and Gallaway; 1996; Filiztekin, 2009; Gözgör, 2012; Baddaley, Martin and Tyler,1998). This might occur due to the cross-regional differences in land endowments, infrastructure, amenities, industrial mix, sectoral composition and other structural characteristics. (Wedder and Gallaway; 1996; Filiztekin, 2009; Gözgör , 2012; Baddaley,

Martin and Tyler,1998). If the hypothesis is correct, persistent spatial differences in unemployment can be observed.

Hypothesis 3. Disequilibrium and no convergence (Hysteresis Hypothesis)

When wages are rigid and labor is not flexible, shocks to employment may not easily be absorbed by regions. Hence, adjustment process to the equilibrium can hardly take place (Wandercamp, 1989, Filiztekin, 2009; Armstrong and Taylor, 1993). In such case, economic shocks become persistent which is in line with Keynesian view that claims persistent impact of shocks (Gözgör, 2012). Hence, regions may not converge to an equilibrium. Main reasons behind this case might be the obstacles against the free flow of labor (due to old age, low skills, moving costs, labor market frictions, family ties, etc) and rigidity of wages driven by protective labor market legislation. (Baddaley, Martin and Tyler, 1998; Dixon and Thrilwall, 1976, Wandercamp, 1989, Filiztekin, 2009; Armstrong and Taylor, 1993). Under this hypothesis, regions do not approach to an equilibrium and it persists sizable differences across regional unemployment rates.

2.1.2. Empirical Findings

A number of empirical studies have tested the hypotheses above. In terms of methodology, majority of the researcher have relied on time series/panel data techniques such as simple ADF or panel unit root tests developed by Levin, Lin, Chu (2002), Breitung (2000) and Im, Pesaran and Shin (2003)

Majority of the studies have found non-convergent regional unemployment rates. It has rather been found that the unemployment disparities tend to persist. Hence, the findings are in line with 2nd and 3rd hypotheses. Some examples of these regional studies are Pissarides and MacMaster (1990) for UK, Decressin and Fatas (1995), Overman and Puga (2002), Baddaley, Martin and Tyler, (1998), Beyer and Stemmer (2016) for EU regions, Blanchard and Katz (1992) for US, Lanzafame (2012) for Italy, Jimeno and Bentolila (1998) and Bande and Karanassou (2006) for Spain. Similarly, Pehkonen and Tervo (1998) have confirmed the validity of the 2nd hypotheses and concluded that there are persistent equilibrium unemployment rates across Finnish regions between 1963-1993.

By contrast, there is a far fewer number of studies that have found converging unemployment rates across regions and declining disparities. Some examples of these studies are Leon-Ledesma (2002) for US, Chang et al. (2007) for Taiwan and Smyt (2003) for Australia.

2.2. Literature on the determinants of Regional Unemployment

2.2.1. Theoretical Arguments

Why do some regions have higher unemployment rate? is another important question. There is a diverse set of determinants that put forward in the literature. The rationale behind these determinants are summarized briefly below.

Labor Market Fundamentals; Labor Supply, Demand and Wages

Increase in labor supply is supposed to increase the unemployment rate as it occurs excessive number of workers available compared to the vacant jobs. Labor supply is generally measured by the growth rate or share of active population (between 15-64 age) in empirical studies.

When firms demand labor more, it is expected to be generated available jobs more and, hence, unemployment rate will decline. Typical variable adopted in empirical papers is the employment growth either at current year or in last 5 years. (Filiztekin, 2009)

Changes in wages have a detrimental effect on employment both from labor demand and supply point of view. From a supply-side perspective, any increase in wages will create an excess labor supply, that in turn, will increase the unemployment rate. Similarly, from a demand side stand point, any increase in wages will reduce the labor demand and employment. Thus, it will increase the unemployment rate. (Elhorst, 1993; Badinger and Url, 2002).

These labor market fundamentals are applied as an Accounting Identity Model to distinguish the impact of labor demand and supply by Gordon and Lamont (1982) and Gordon (1988) such as:

Unemployment= Labor Supply (PW x L + NC) – Labor Demand (E)

PW: Working age population, L: Labor Participation Rate, NC: Inward Commuting, E: Employment

The equation above states that unemployment occurs as a difference between labor supply and demand. Labor supply or demand can be more dominant and the equation should be well analyzed.

Local Area Characteristics

There is a large number of region specific variables that has been considered as the determinant of unemployment rates which can affect both labor demand, supply and wages. To start with, education attainment and human capital represent the variables indicating the level of skills and human base quality. Individuals with higher education and human capital face less risk of being laid off. It is, moreover, less likely to experience miss-match and frictional problems and, thus, unemployment is expected to be lower in regions with high education. (Filiztekin, 2009; Burridge and Gordon, 1981; Siegers, 1983; Holzer, 1993; Elhorst, 2003)

Sectoral composition (industrial mix) of regions, the degree of specialization and transformation of industrial structure are also quite important determinants. Declining industries are known to bring higher unemployment (Martin, 1997; Filiztekin, 2009; Elhorst, 2003). For instance, regions that transform rapidly from agriculture based economic activities to industry or high tech sectors are likely to experience high unemployment rates as workers in agriculture sector has totally different skills than the qualifications needed in high tech sectors.

Market potential is supposed to reduce unemployment as firms prefer operating in these areas which there is a large potential of customers (Elhorst, 1995 ; Molho, 1995; Isserman et al., 1986). Hence, it is generated more the job opportunities in big market areas. It is generally measured by GDP, population or population density.

As another determinant, migration is argued to have two sided effect. First, as a region receives more in migration, labor supply directly increases. In turn, this induces the unemployment. Alternatively, If the immigrants are qualified and talented, labor demand is expected to increase more compared to labor supply since the region becomes more attractive for companies. (Chalmers and Greenwood, 1985; Ghatak et al. 1996). The net change in unemployment depends on which impact is more dominant.

Finally, natural amenity is a crucial variable for the attraction of high skilled workers in the region that increases the labor demand and reduce unemployment rate. However, if labor excessively flows into these regions, then, it creates an excess labor supply and unemployment rises (Burridge and Gordon, 1981; Layard et al. 1991; Vedder and Gallaway, 1996)

2.2.2. Empirical Findings (E)

The determinants that are discussed above are tested in various empirical papers. To start with wages, although theoretically rising wages should increase unemployment, empirically an inverse relationship has been found by scholars (Murphy, 1985; Burridge and Gordon, 1981; Hofler and Murphy, 1989; Badinger and Url, 2002)

Regarding industrial structure variables, there are quite mixed results in the literature. For instance, while Summers (1986), Blackley (1989) and Patrick and Rickman (1995) have found that specialization in manufacturing increases the unemployment, Jones and Manning (1992) and Elhorst (1995) have found a controversial impact. In line with latter findings, Badinger and Url (2002) has found that productivity growth in manufacturing has created a permanent substitution of labor with capital and, hence, increasing impact on unemployment. The same ambiguity of findings exists also for specialization in agriculture sector as Malizia and Ke (1993) and Taylor and Bradley (1997) have totally controversial findings.

As another determinant, migration has also quite distinguished effects. On the one hand, Bilger, Genosko and Hirte (1991) and Veen and Evers (1983) have shown that net in migration has a detrimental effect on unemployment, while, on the other hand, it has an

increasing effect as found in Chalmers and Greenwood (1985) and Hofler and Murphy (1989).

2.3. Literature on Turkey (F)

In this field, there is a very limited number of studies on Turkey. There are few exceptional papers. The first one is implemented by Filiztekin (2009). The paper analyzes the extent of the imbalances across regions and the determinants of such variation in unemployment. It analyzes provincial unemployment rates for the years 1980 and 2000. He finds that aggregate unemployment has been rising in Turkey, both at the urban and rural areas. However, the dispersion of the unemployment is very sizable (particularly in urban areas) and the imbalances are getting even more serious recently. In terms of cross regional determinants, young population share, primary school graduation rate, employment growth minus active population growth are found to be factors that are positively associated with low rates of unemployment in provinces. Controversially, population density is a determinant that rises provincial unemployment.

Another study is implemented by Akçagün , Ocal and Yildirim (2013). They analyze the heterogeneity of regional unemployment rate in Turkey between 2004-2011. It has been found a high level of heterogeneity in unemployment both across regions and sectors. Moreover, by using SUR methodology, they found that regional unemployment rates tend to converge in services sector, persists in industry and diverge in agriculture sector. Similarly, Temel, Tansel and Güngör (2005) have found a similar finding on regional and sectoral unemployment convergence.

Finally, Gözgör (2012) who analyzes the unemployment convergence across 26 regions between 2004-2011, found a persistence and non-convergent unemployment rates.

Turkey is a relevant field of study since it includes remarkable regional differences. (Karahasan, 2015; Oktay and Gözgör, 2013; Duran, 2015a; Duran2015b, Duran 2016a, Duran 2016b)

2.4. Contribution to the Literature

In the above summarized literature, cross regional determinants and regional unemployment convergence has been thoroughly analyzed. However, far little attention has been paid on the detailed reasons for region specific rise in unemployment rates.

For instance, in regions, which subgroups (with respect to gender, age and education) display a higher unemployment rate? Does labor supply or demand matter more in the evolution of unemployment rate? In which regions, changes in demand/supply is more dominant? In which sub-groups, changes in demand or supply is more dominant?

All these questions are important and might shed light on the regional specific unemployment problem.

3. Empirical Analysis

In this section, we pursue our empirical analyses by dividing the section into three main research questions below.

3.1. Does regional unemployment rates converge?

An initial step in our empirical analyses is to implement a convergence analyses. However, since the time period of analyses (2004-2017) falls short, it becomes not possible to apply traditional time series convergence techniques (such as panel unit root etc). Instead of this, we rely more on descriptive analyses and distributional dynamics of the regional unemployment rates.

Table 1 below documents basic statistics of regional unemployment rate for the years 2004 and 2017. At a glance, it seems that cross regional mean of unemployment rate seems to persist (while it is 10.2 % in 2004 and it becomes 10.0 % in 2017). In other words, the unemployment problem remains more/less same at the aggregate level. However, its dispersion across regions is getting more pronounced over the years. Such that while it ranges between 1.8 % (TRA2- Ağrı, Iğdır,Ardahan,Kars) and 19.2 % (TRB1-Malatya,Elazığ,

Tunceli, Bingöl) in 2004, it ranges between 3.6 (TR-90 Tranzon,Rize, Giresun,Artvin, Ordu,Gümüşhane) % and 26.9 % (TRC3-Şırnak, Mardin,Batman,Siirt) in 2017. Consistently, from 2004 to 2017, standard deviation, skewedness and kurtosis of the distribution is increasing which points to a more heterogeneous distribution of unemployment rates across regions. According to Jarque-Bera test applied for each year, the distribution of unemployment is shown to have a normal distribution in 2004, but the normality is rejected for 2017.

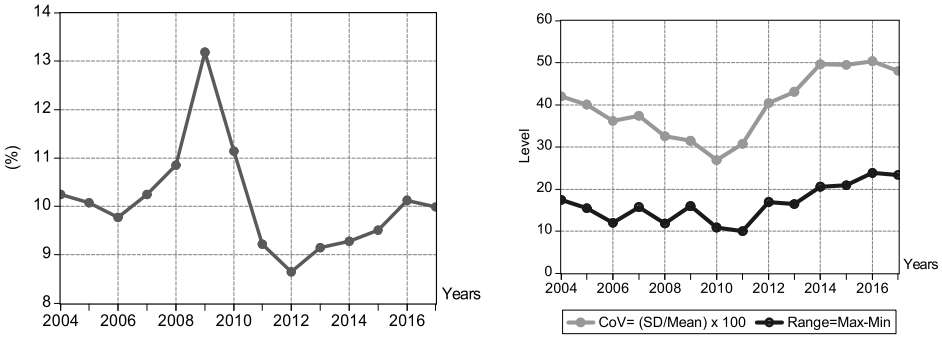
Table 1. Descriptive Statistics

Indicator	2004	2017
Mean	10,2	10,0
Maximum	19,2	26,9
Minimum	1,8	3,6
Range (Max-Min)	17,4	23,3
SD	4,3	4,8
Skewness	0,2	1,6
Kurtosis	2,4	6,9
Jarque-Bera	0,5	26,9
Jaruqe Bera Probability	0,8	0,0

To investigate in dept the tendency of regional unemployment rates to converge each other, we provide two consecutive figures below. Figure 1 (1.2) demonstrates the evolution of cross regional coefficient of variation and range over time. It seems that from 2004 to 2010 regional unemployment rates tend to converge and dispersion declines. However, after 2011, both coefficient of variation and range increases. Hence, overall, there is no tendency to converge but the regional unemployment disparities rather increase over time.

As a second related graph (in figure 2), the Kernel density estimation have been estimated for 2004 and 2017 years. It is clearly seen that initially the distribution of unemployment across regions is normal, unimodal and homogenous. However, in 2017, the distribution becomes more heterogeneous and bi-modal which is a result in line with non-convergent but diverging regional unemployment rates.

Figure 1. Unemployment rate over time cross-regional average



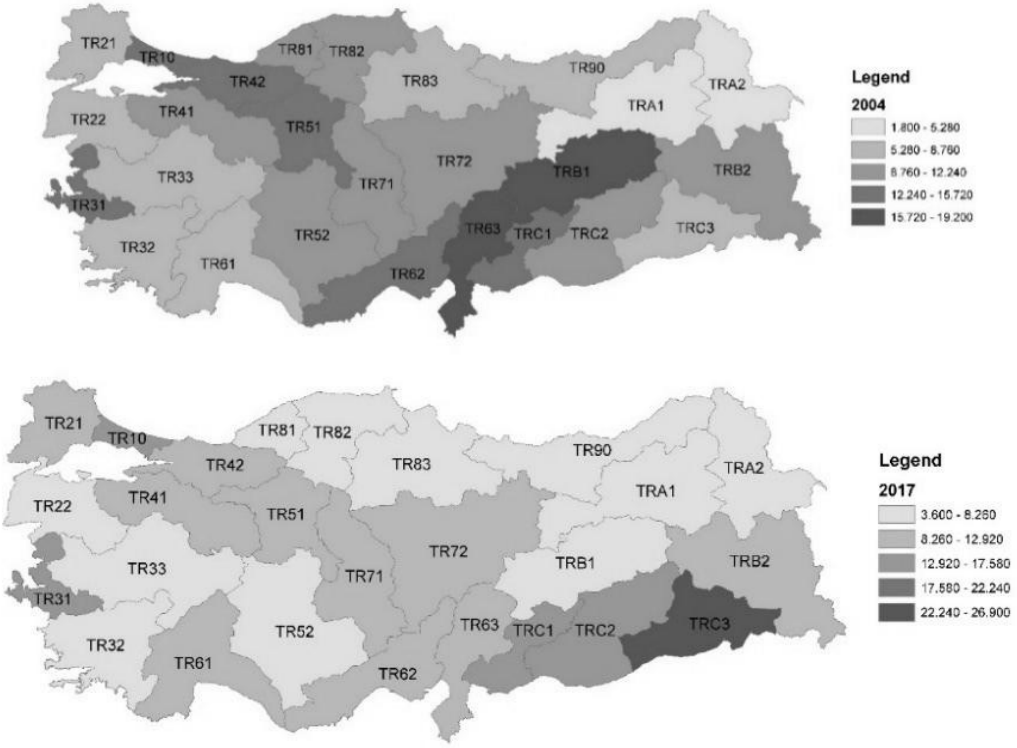
1.1 Cross-regional average **1.2** Cross Regional Dispersion

Figure 2. Kernel distribution of unemployment rates

3.2. Which regions and subgroups have higher unemployment rates?

To shed light on this issue, first, the geographical distribution of regional unemployment rates is displayed in maps. (Figure 3). At a glance, it is observed that from 2004 to 2017, pattern of unemployment has considerably changed. While, in 2004, industrial zones and metropolitan cities have the highest unemployment, in 2017, Southeast region has become dominantly a high unemployment region. Northeastern parts and Blacksea coastal regions have remained consistently as low unemployment regions.

Figure 3. Geographical Distribution of Unemployment Rates



As another important point, we document in the Table 2 the region and sub-group specific rate of unemployment. Sub-groups are determined on the basis of gender, age and education groups. In age groups, 15-24 years represent young group, 24-35 years mid-young group and 35-54 years mid old group. In terms of education, lower degree than high school represents low education group, high school graduates represent middle level educated group and university graduates represent highly educated group. It is a helpful analysis to explore the region specific sources of unemployment. Several implications can be drawn; i. on average, female unemployment rate (10.8) is slightly higher than male unemployment rate (9.7%). Among the age groups, highest unemployment rate is observed for youngest cohort (19 %) where lowest unemployment for the mid-old group (7%). Among the education groups, middle level educated group has the highest unemployment rate (12.8 %) compared to low (9%) and high education (10.7 %) group. ii. There are extremely low and high unemployment rates in various sub-groups and regions. For instance, lowest unemployment rate is observed for TR90 region and mid-old group (3%) whereas highest unemployment rate is observed for TRC3 and youngest group (28.5 %).

The evolution of unemployment for different sub-groups have been analyzed in Table 3. Percentage changes of unemployment over the period 2004-2017 is calculated. In Table 3, while gray color represents increasing trend of unemployment, the pink color represents a decreasing trend. It is observed that a very diverse set of tendencies is observed. Firstly, at the aggregate level male, young, low and middle level educed groups' unemployment rate has been rising while female, middle age and highly educated groups' have been increasing. There is a considerable variation across regions and subgroups in the magnitude and direction of unemployment change. There are some extreme cases. For instance, the group that has fastest increase in unemployment occurs in region TRC3, female group (36 %) while the

decline in unemployment occurs fastest in region TRB1, youngest group (26 %). Other detailed region and group specific dynamics can be observed in Table 3.

Table 2. Regional unemployment rates

Regions	Total	Male	Female	15-24 ages (young)	25-34 ages (mid-young)	35-54 ages (mid-old)	Low_edu	Mid_edu	High_edu
TR10	12,5	11,2	15,7	20,1	11,1	10,3	12,9	12,7	11,0
TR21	8,5	6,8	12,5	18,3	8,7	6,5	7,7	9,8	9,2
TR22	6,4	5,7	7,9	15,1	8,2	4,3	5,0	9,2	9,3
TR31	14,1	12,0	18,7	25,1	14,2	10,4	13,8	16,4	12,4
TR32	8,6	7,6	10,6	16,9	10,3	6,2	7,6	11,4	10,4
TR33	6,5	6,4	6,5	14,6	7,8	4,2	5,4	9,6	8,8
TR41	8,8	7,9	11,3	16,8	9,4	6,2	8,2	9,9	9,6
TR42	11,5	10,2	14,6	22,5	11,5	8,2	11,0	12,7	12,2
TR51	11,9	9,8	17,2	25,2	12,0	7,7	12,5	13,1	9,8
TR52	7,9	7,2	10,0	16,0	8,5	5,0	6,9	11,6	8,9
TR61	9,0	8,0	10,9	17,6	10,3	6,6	8,1	11,9	9,7
TR62	14,1	12,5	18,3	23,8	16,1	9,6	12,6	18,3	14,7
TR63	14,1	14,0	14,4	23,6	15,9	10,5	13,9	17,1	14,4
TR71	10,0	9,8	10,1	20,9	11,6	6,3	9,0	14,7	10,4
TR72	10,8	10,0	13,2	22,0	12,0	6,9	9,8	14,2	11,6
TR81	7,8	8,2	7,3	20,2	10,6	4,5	6,2	12,8	12,5
TR82	6,7	6,0	8,1	15,0	9,0	4,4	5,8	10,8	8,6
TR83	6,8	6,7	7,0	13,5	9,4	4,5	5,7	11,3	10,7
TR90	5,8	6,5	4,8	18,3	8,8	3,0	4,4	10,4	9,9
TRA1	5,8	7,0	3,2	11,6	7,8	3,4	5,3	8,8	7,5
TRA2	6,0	7,3	3,0	11,1	7,2	3,7	6,4	8,4	6,0
TRB1	11,9	11,7	12,2	25,0	14,4	7,0	11,2	16,2	14,6
TRB2	11,7	13,1	6,0	18,2	13,9	7,4	13,1	15,7	10,2
TRC1	13,5	13,8	10,6	19,9	14,0	10,7	14,3	12,8	10,8
TRC2	13,8	15,0	7,8	17,8	14,9	11,6	15,1	13,9	10,4
TRC3	18,3	18,2	18,5	28,2	18,7	13,0	19,7	18,2	14,2
Mean	***10,1***	***9,7***	***10,8***	***19,1***	***11,4***	***7,0***	***9,7***	***12,8***	***10,7***
Max	***18,3***	***18,2***	***18,7***	***28,2***	***18,7***	***13,0***	***19,7***	***18,3***	***14,7***
Min	***5,8***	***5,7***	***3,0***	***11,1***	***7,2***	***3,0***	***4,4***	***8,4***	***6,0***
Range	***12,5***	***12,5***	***15,6***	***17,2***	***11,5***	***9,9***	***15,3***	***9,8***	***8,7***
SD	***3,3***	***3,3***	***4,6***	***4,4***	***3,0***	***2,8***	***4,0***	***2,9***	***2,2***
Cov	***0,3***	***0,3***	***0,4***	***0,2***	***0,3***	***0,4***	***0,4***	***0,2***	***0,2***

Table 3. Change in unemployment rates (2004-2017)

	male	female	young	mid-young	mid-old	low edu	mid edu	high edu
TR10	-0,12	3,61	3,93	0,96	1,91	1,21	1,65	2,66
TR21	0,11	4,76	2,61	0,50	3,51	2,10	-0,27	2,23
TR22	-1,74	2,44	0,00	-0,22	-0,57	0,10	-4,04	-5,22
TR31	-2,66	-1,18	-0,48	-1,21	-0,27	-1,32	-1,67	-3,55
TR32	-0,77	-0,69	0,11	0,99	-0,73	-1,29	-3,58	0,24
TR33	-3,41	2,72	-4,12	-1,54	0,92	-1,10	-5,56	-3,72
TR41	-0,13	1,71	2,40	2,08	0,78	1,30	-2,67	-1,01
TR42	-3,84	2,72	-7,67	0,76	-0,26	-2,26	-3,27	-0,26
TR51	-3,30	-8,35	-9,81	-0,75	-1,62	-3,69	-6,74	-0,20
TR52	-3,84	0,17	-7,08	-1,94	-1,86	-2,49	-8,53	-3,76
TR61	3,40	8,60	7,10	5,63	4,72	4,76	5,10	5,04
TR62	-4,80	-4,79	-6,29	-4,07	-3,10	-3,55	-9,41	-5,53
TR63	-7,33	-2,67	-7,42	-6,49	-3,76	-7,18	-8,23	0,35
TR71	-3,01	11,99	3,54	1,21	2,58	1,11	-7,08	2,92
TR72	-0,32	7,76	1,13	4,04	2,65	1,35	-0,45	4,07
TR81	-7,73	1,18	-6,03	-6,94	-0,01	-4,25	-9,83	-4,86
TR82	-6,57	-6,27	-14,72	-5,40	-1,32	-5,98	-10,76	-2,02
TR83	-1,00	3,24	1,36	-0,56	2,06	1,39	-5,17	-4,53
TR90	-5,04	-1,24	-3,01	-4,19	-0,84	-2,53	-11,58	-4,78
TRA1	1,12	3,98	7,38	2,03	2,79	1,23	0,49	0,86
TRA2	3,87	3,11	6,28	3,29	3,40	3,17	0,62	9,52
TRB1	-13,92	-8,73	-26,92	-9,03	-4,52	-14,74	-15,08	-9,78
TRB2	1,80	7,92	-4,58	3,66	5,93	0,65	1,37	7,62
TRC1	-1,80	9,55	7,50	0,85	-4,65	-1,93	1,01	7,74
TRC2	2,14	4,20	2,31	0,77	2,03	0,95	4,27	5,16
TRC3	17,18	36,19	31,20	18,94	15,55	21,50	16,65	12,25
Mean	-1,61	3,15	-0,82	0,13	0,97	-0,44	-3,18	0,44
Number of Increasing regions	7	18	13	15	14	12	8	14
Number of decreasing regions	19	8	13	11	12	14	18	12

3.3. Does labor supply or demand matters for regional unemployment change?

To investigate this issue, we use unemployment accounting identity model (as introduced in literature review part) used by. Gordon and Lamont (1982) and Gordon (1988). It refers to the following identity:

Unemployment= Labor Supply – Labor Demand (1)

ΔUnemployment= ΔLabor Supply – ΔLabor Demand (2)

Where Δ denotes the change over the period 2004-2017. Labor supply is measured by the number of people in labor force, labor demand is measured to by total number of employed people.

The equations above states that unemployment occurs as a difference between labor supply and demand. Labor supply or demand may be dominant and the equation should be well analyzed.

we first develop a measure that shows the relative importance of labor supply with respect to demand for the evolution of unemployment.

Relative Importance of Labor Supply= Absolute Change in Labor Supply/Absolute Change in Labor Demand (3)

If the resulting ratio is above 1, it means the change in unemployment is more dominantly driven by increase/decrease in labor supply. In contrast, if it is below 1, labor demand is more dominant. The results are summarized in Table 4 below.

There are several important results. First, there are 19 regions, the change in unemployment is labor supply driven whereas only 7 is demand driven. Second, in terms of gender groups, change in female unemployment is supply driven (24 regions) compared to the male unemployment (14 regions). In terms of age, middle age old group is the most supply driven age group (23 regions) followed by middle age young (19 regions) and young groups (16 regions). Finally, with respect to education groups, in highly educated group, the evolution of unemployment is labor supply driven (26 regions) followed by middle level educated (15 regions) and least educated group (17 regions). Hence, in Turkey, rise/decline in regional unemployment is mostly triggered by increase in labor supply.

As a sum, we analyzed 26 regions and 8 sub-groups. Hence, we used a data for 208 (26 x 8) observations. Out of 208, 154 of the cases is labor supply driven which corresponds to 74 % of the data. Hence, one may consequently argue that the changes in unemployment in Turkey is mostly caused by changes in labor supply. In other words, unemployment problem is mainly an excessive labor supply problem.

To complement our results, we develop a panel regression model and test, in this way, the relative impact of labor supply or demand:

$$\ln \Delta uneployment_{i,t} = \beta_0 + \beta_1 \ln \Delta labor\ supply_{i,t} + \beta_2 \ln \Delta labor\ demand_{i,t} + \exists_{i,t}$$

In order to capture the region fixed and time fixed effects, we add necessary dummies to the model.

The model is estimated for each sub-group and by referring to whole period and only after the global economic crisis in 2008-2009. For the sake of robustness, we applied several spatial dependence tests to the model which has return no significant bias due to spatial autocorrelation (Table 5).

The results of the regression analyses are presented in Tables 6 and 7. In all of them, regardless of which sub-group has been employed and regardless of whether the period of analyses refers to entire or only post crisis time, labor supply has robustly a greater and significant impact compared to the labor demand. Consistent with expectations, the labor demand has always a negative coefficient whereas labor supply has a positive and significant coefficient.

Hence, one may safely argue that in Turkey, the main dynamic behind the unemployment is due to labor supply reasons, both in increase or decrease of unemployment.

4. Conclusions and Policy Implications

In this study, we tried to pursue an empirical analysis to shed light on region specific and detailed causes of unemployment in Turkish regions for a period 2004-2017. Our statistical analyses indicate three main results.

First, there is a sizable difference in unemployment rates across regions and the dispersion is getting stronger over time. Hence, there is no tendency to converge but the regional unemployment rates rather tend to diverge. Second, among the subgroups, on average, female unemployment rate (10.8) is higher than male unemployment rate (9.7%). With regard to the unemployment in age groups, highest unemployment rate is observed for youngest cohort (19 %) where lowest unemployment for the middle aged old (35-54 age) group (7%). Regarding the education groups, middle level educated group has the highest unemployment rate (12.8 %) followed by low (9%) and highly educated (10.7 %) group. ii. There are extremely low and high unemployment rates in various sub-groups and regions. For instance, lowest unemployment rate is observed for TR90 region (middle age old group (3%)) whereas highest unemployment rate is observed for TRC3 (youngest group (28.5 %)).

Table 4. Absolute Change in labor supply/ Absolute Change in labor demand

Spatial Dependence Tests	Test Statistics	P-Value
Lagrange Multiplier Error	0,974	0,324
Lagrange Multiplier Lag	0,330	0,856
Robust Lagrange Multiplier Error	1,776	0,183
Robuts Lagrange Multiplier Lag	0,835	0,361

Table 5. Spatial Dependence tests

BÖLGE KODU	Total	Male	Female	Young	Mid-Young	Mid-old	Low Edu	Mid Edu	High Edu
TR10	1,20	1,13	1,27	1,59	1,18	1,15	1,21	1,22	1,18
TR21	1,14	1,07	1,28	1,63	1,11	1,15	1,18	1,10	1,12
TR22	1,04	0,90	1,21	1,15	1,07	1,02	1,04	1,00	1,04
TR31	1,12	1,03	1,22	0,50	1,11	1,12	1,04	1,16	1,13
TR32	1,05	1,03	1,08	1,25	1,21	1,03	0,91	1,03	1,12
TR33	0,97	0,75	1,19	1,47	0,94	1,09	1,59	0,97	1,08
TR41	1,12	1,09	1,19	0,20	1,34	1,09	1,47	1,04	1,11
TR42	1,09	1,02	1,20	1,08	1,17	1,08	1,08	1,06	1,14
TR51	1,05	1,02	1,08	0,57	1,11	1,06	1,02	0,92	1,12
TR52	0,98	0,92	1,08	0,92	1,00	0,99	0,96	0,85	1,06
TR61	1,28	1,21	1,39	1,71	1,46	1,18	1,33	1,30	1,19
TR62	1,01	0,90	1,12	0,99	0,79	1,03	0,94	0,92	1,13
TR63	1,01	0,91	1,15	0,93	0,89	1,03	0,92	0,99	1,19
TR71	1,17	0,95	1,68	0,25	1,22	1,16	1,29	1,04	1,21
TR72	1,20	1,09	1,32	1,43	1,31	1,13	1,17	1,17	1,21
TR81	0,80	0,59	1,14	1,64	1,59	1,06	0,36	0,61	1,08
TR82	0,96	0,84	1,03	0,40	0,89	1,02	0,94	0,75	1,09
TR83	0,71	0,73	0,72	1,11	1,17	1,19	0,93	0,00	1,08
TR90	2,71	0,08	1,15	1,26	1,45	0,98	1,28	0,73	1,04
TRA1	0,87	NA	0,90	0,98	0,95	1,28	0,98	1,10	1,09
TRA2	1,26	1,34	1,14	1,40	1,20	1,24	1,25	1,11	1,17
TRB1	0,83	0,65	1,04	0,00	0,70	0,98	0,75	0,59	1,08
TRB2	1,19	1,22	1,15	1,12	1,25	1,28	1,16	1,26	1,26
TRC1	1,17	1,09	1,28	1,88	1,23	1,05	1,10	1,20	1,28
TRC2	1,19	1,21	1,15	1,24	1,18	1,16	1,16	1,32	1,22
TRC3	3,53	2,54	3,75	5,71	3,43	1,85	4,00	2,20	1,37
Supply Dominant Cases	19	14	24	16	19	23	17	15	26
Demand Dominant Cases	7	11	2	10	6	3	9	10	0

Third, changes in unemployment is mostly driven by changes in labor supply rather than labor demand regardless of which sub-groups and time period analyzed. We confirm this result both by using descriptive statistics and inferential panel data regression analyses. We found that out of 26 regions, there are 19 regions in which dominant unemployment dynamic is the changes in labor supply. For all subgroups, there are more labor supply driven cases than the labor demand driven cases. Among the 208 cases (26 regions x 8 sub-groups), in 154 cases, the major driver of unemployment is the change in labor supply.

These results have important policy implications. Migration policies should be revised. Once, migration takes place from underdeveloped regions to the developed ones, this creates an excess labor supply. The labor market frictions might increase since the skills and talents of migrants can hardly meet the needs of employers in developed areas. Hence, excessive labor supply and miss-match problem is a very important cause of unemployment. Another

important policy implication regards the transformation from an agricultural based economic structure to an industrialized and service based economy. As the agriculture loses its share in rural regions, massive agricultural labor become unemployed and tend to move towards industrialized and metropolitan cities. Hence, in order to come over such a problem, policies regarding agriculture sector, its modernization and stimulation should be maintained. By following relevant policies, excess labor supply can be cured and it can provide a solution for regional unemployment problem

Table 6. Regression Analysis Results

Variables	Total	Male	Female	Young	Mid-young	Mid-Old	Low Edu	Mid Edu	High Edu
Labor_supply	8,646	8,500	9,460	5,303	8,188	11,991	8,135	7,795	9,660
Labor_demand	-7,793	-7,787	-8,337	-4,279	-7,090	-11,363	-7,370	-6,757	-8,604
constant	0,004	0,002	-0,001	0,004	-0,001	0,018	0,002	-0,002	-0,005
Regional Fixed Effect Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional Time Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	338	338	338	338	338	338	338	338	338
R-Squared	0,86	0,86	0,73	0,92	0,9	0,81	0,82	0,92	0,91
Histogram Normality Test	1192***	1610***	1601***	316***	626***	293***	422***	414***	1546***

Table 7. Regression Analysis Results (post crisis)

Variables	Total	Male	Female	Young	Mid-young	Mid-Old	Low Edu	Mid Edu	High Edu
Labor_supply	8,413	8,072	9,901	5,284	7,998	11,483	7,892	7,585	9,456
Labor_demand	-7,585	-7,400	-8,715	-4,269	-6,869	-10,823	-7,179	-6,555	-8,395
constant	0,003	0,002	-0,003	0,003	0,000	0,012	0,002	-0,001	-0,004
Regional Fixed Effect Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional Time Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	338	338	338	338	338	338	338	338	338
R-Squared	0,85	0,86	0,72	0,91	0,89	0,78	0,81	0,91	0,9
Histogram Normality Test	3049***	7260***	1960***	811***	1363***	1101***	1379***	1013***	2503***

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Appendix 1. Region Codes and Provinces

Code of the Region	Provinces in the region
TR10	Istanbul
TR21	Tekirdag, Edirne, Kirklareli
TR22	Balikesir, Çanakkale
TR31	Izmir
TR32	Aydin, Denizli, Mugla
TR33	Manisa, Afyon, Kütahya, Usak
TR41	Bursa, Eskisehir, Bilecik
TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova
TR51	Ankara
TR52	Konya, Karaman
TR61	Antalya, Isparta, Burdur
TR62	Adana, Mersin

Code of the Region	Provinces in the region
TR63	Hatay, Kahramanmaras, Osmaniye
TR71	Kirikkale, Aksaray, Nigde, Nevsehir, Kirsehir
TR72	Kayseri, Sivas, Yozgat
TR81	Zonguldak, Karabük, Bartin
TR82	Kastamonu, Çankiri,Sinop
TR83	Samsun, Tokat, Çorum, Amasya
TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüshane
TRA1	Erzurum, Erzincan, Bayburt
TRA2	Agri, Kars, Igdir, Ardahan
TRB1	Malatya, Elazig, Bingöl, Tunceli
TRB2	Van, Mus, Bitlis, Hakkari
TRC1	Gaziantep, Adiyaman, Kilis
TRC2	Sanliurfa, Diyarbakir
TRC3	Mardin, Batman, Sirnak, Siirt