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Regional Unemployment in Turkey: A Spatial Panel Data Analysis

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ABSTRACT

In particular, the prevalence of large regional disparities in unemployment rates stems from longstanding regional development disparities within a country. Turkey struggles against two major regional economic problems: regional development disparities, which is a major issue, and regional inequalities in unemployment. In Turkey, regional development differences and regional disparities in unemployment rates are fairly large and persistent. By using a spatial panel data technique, this paper analyzes the determinants of Turkish regional unemployment disparities for the period from 2008 to 2012 and whether the spatial interaction exists among Turkish regions. The findings show that a significant relationship is found among the regional unemployment rate and male labor force participation rate, the share of young population, and the share of agriculture in employment and educational attainment. In addition, a positive spatial correlation is found among the regional distribution of unemployment rates.

Keywords: Regional unemployment, panel data, spatial analyses, Turkey

ÖZ

İşsizlik oranlarındaki büyük bölgesel farklılıklar, özellikle ülke içinde uzun süredir devam eden bölgesel gelişme farklarının kaynaklanmaktadır. Bu bağlamda, Türkiye iki büyük bölgesel ekonomik sorunla mücadele etmektedir; kendi içinde başlı başına büyük bir sorun olan bölgesel gelişmişlik farklılıkları ve bölgeler arasındaki işsizlik oranı farklılıkları. Türkiye'deki bölgesel gelişmişlik farklılıkları ve bölgesel işsizlik farklılıklar oldukça geniş boyutlu ve yıllardır devam eden bir sorundur. Bu çalışmada, mekansal panel veri tekniği kullanılarak, 2008-2012 dönemi için Türkiye'deki bölgesel işsizlik farklılıklarını belirleyen faktörler ve bununla birlikte bölgeler arasındaki mekansal etkileşimin varlığı incelenmiştir. Analiz sonuçlarına göre, erkeklerin işgücüne katılma oranı, genç nüfusun payı, istihdamda tarım sektörünün payı ve eğitim düzeyi ile bölgesel işsizlik oranı arasında anlamlı bir ilişki bulunmuştur. Bunla birlikte, işsizlik oranlarının bölgelerarası dağılımında pozitif bir mekansal ilişki bulunmuştur.

Anahtar Sözcükler: Bölgesel işsizlik, panel veri, mekansal analiz, Türkiye

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I. INTRODUCTION

In many countries, the aggregate and regional unemployment is one of the most important indicators of economic and social well-being. Though over five years have passed since the onset of the global economic and financial crisis, unemployment still remains high in many European Union (EU) countries and Turkey. Unlike majority of EU countries, the unemployment rate in Turkey has gradually dropped, but is still relatively high. While in 2012 the average unemployment rates of the EU-28, EU-15, and euro area (17 countries) for the age group of 15–64 years were 10.6%, 10.7%, and 11.4%, respectively, the unemployment rate of Turkey was 8.3%, which was less than those of the member states (Eurostat 2013a). In addition to the nationwide aggregate unemployment, the regional dispersion of employment and unemployment is another major concern in these countries. Regional inequalities in unemployment and employment rates are especially pronounced in Italy, Belgium, Germany, Spain, Turkey, and Central and Eastern European countries (OECD 2005: 75). Relating to regional cohesion, a dispersion rate can be used to measure the difference in employment rates between regions (across the NUTS level 2 regions of the same country). In this context, in 2011 both Turkey (12.7%) and Croatia (10.1%) had dispersion rates higher than those in all EU member states except Italy (17.9%). The rise in the dispersion rate indicates that regional employment rates in these countries were less homogeneous (Eurostat 2013b). In 2012, a wider regional unemployment gap was observed among 26 NUTS level 2 regions of Turkey. The lowest unemployment rate was recorded below 5% in the western part of Turkey, with 4.1% in Manisa, Afyonkarahisar, Kütahya and Uşak (TR33 Region), and 4.5% in Balikesir, Çanakkale region and Kastamonu, Çankırı and Sinop (TR22 Region). However, the highest regional unemployment rate was recorded in the southeast of Turkey with 18.8% in Mardin, Batman, Sirnak, and Siirt (TRC3 Region; Eurostat 2013c).

In particular, the prevalence of large regional disparities in unemployment rates stems from longstanding regional development disparities within a country. Turkey, as a candidate country of EU, struggles against two major regional economic problems: regional development disparities, which is a major issue, and regional inequalities in unemployment. In Turkey, regional development differences and regional disparities in unemployment rates are fairly large and persistent (Filiztekin 2009: 867; OECD 2013: 102).

There is a wide development gap between administrative and geographical regions in Turkey, especially between the western and eastern parts. Moreover, regional development disparities of Turkey are significantly larger than any old and new member state (Reeves 2006: 35; Wolleb and Daraio 2009: 19).

In addition to Turkey's fragile macroeconomic stability, high inflation, high exchange rates, political turmoil and policy failures, geographic and climate difficulties, high distance to ports and markets, relatively less investments and unbalanced distribution of industry clusters, inadequate agricultural activities, and unequal distribution of per capita GDP, the high fertility rate and thus migration from less developed regions to big cities can be considered as distinctive factors for eastern regions which affect (cause) regional development disparities between the eastern and western parts of Turkish regions.

In this regard, there are many different economic and demographic factors that are associated with the national and regional unemployment rate disparities among Turkish regions. First, Turkey is still undergoing a demographic transition. Migration from rural to urban areas surges semi qualified or unqualified workers into the urban labor market and increases the unemployment rate. Those who leave agriculture fail to meet the requirements of high skilled and educated jobs. Former unpaid family workers, especially women, do not enter to the urban labor market which requires higher skills. Notably, shrinking of the agricultural sector and changing in sectoral economic pattern of Turkish economy from labor-intensive sectors to more skilled and qualified capital-technology-intensive sectors require immediate policies to stop melt these populations. In addition to migration, cultural, traditional, institutional, and educational factors also affect the labor force participation rate of women, which is the lowest among the EU countries. Unlike the EU, Turkey has significant youth population and this causes a surge of young population into the labor market. In addition to regional disparities in the distribution of industrial clusters and investments, high economic growth in last decades was not able to create the expected jobs in Turkey. The low level of human capital (educational attainment) constrains and/or prolongs new workforce requirements.

Disparities between regions in EU member states were into existence long before the creation of the European Community, therefore reducing regional inequalities and labor market differentials has become important during the integration process of the EU. In this context, there has been increasing number of cross-section and panel data studies that have focused on the regional determinants of unemployment within member states and regions of the EU (Overman and Puga 2002; López-Bazo et al. 2002; Badinger and Url 2002; Niebuhr 2003; Aragon et al. 2003; L´opez-Bazo et al. 2005; Cracolici et al. 2009; Patuelli et al. 2012; Novotný and Nosek 2012; Lottmann 2012; Marelli et al. 2012; López-Bazo and Motellón 2013) [1].

Though the issues of regional development differences in Turkey have been investigated extensively, employment studies at regional level generally focus on the regional employment dynamics of Turkey. Boratav et al. (1994) and Senses (1997) focused on the effects of trade liberalization on labor participation. Tunali (1997), Özar and Günlük-Senesen (1998), and Tansel (2002) examined the female labor force participation in Turkey. Doğruel and Özerkek (2011) explored the factors affecting the unemployment, such as sectoral composition and skill levels of labor force on the aggregate level unemployment. Bildirici et al. (2012) investigated the aggregate unemployment within the framework of hysteresis effect and persistence. To the best of our knowledge, a limited number of studies attempted to explain regional unemployment disparities in Turkey despite the emergence of works on the issue in recent years. Filiztekin (2009) investigated the regional unemployment disparities in Turkey at provincial aggregate and urban levels in two particular years, 1980 and 2000, by using spatial and nonparametric techniques. He found a strong evidence for spatial correlation in unemployment rates and high unemployment clusters in the southeast of the country. According to the results, while human capital and demand deficiency are the sources of the observed disparity across provinces, the determinants of local unemployment have changed over the years. In another pattern of the regional unemployment studies, Gözgör (2012) examined the hysteresis effect in regional unemployment rates in Turkey from 2004 to 2011. Köse and Güneş (2013) examined the persistency and the effects of educational attainments in the regional unemployment, employment, and labor force participation rates of 26 NUTS level 2 regions of Turkey for the period from 2004 to 2012. Gözgör (2013) investigated the unemployment persistence at the regional level for 26 NUTS level 2 regions of Turkey for the period from 2004 to 2011.

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1 Taylor and Bradley (1997) and Elhorst (2003) summarized the previous studies.

In this study, a spatial panel econometric method based on spatial autocorrelation techniques is used to explore the geographical distribution of unemployment for Turkish regions. Therefore, the aim of this paper was to describe the unemployment disparities between 26 NUTS level 2 regions of Turkey for the period from 2008 to 2012 and shed light on the causes of existing differential and spatial interaction among regions. Apart from previous studies, this paper is the first one that attempts to focus on disparities in the regional unemployment rate, its causes, and spatial effects in Turkey by using a panel data technique.

This paper is organized as follows: Section 2 discusses the potential variables that explain the causes of the regional unemployment. Section 3 briefly describes the technique used in this study and presents a simple panel data model of the regional unemployment. The regression results are provided in Section 4. Finally, Section 5 summarizes the main results and concludes the study.

II. DETERMINANTS OF REGIONAL UNEMPLOYMENT

Economic differences that consequently lead to labor market differentials within a country are stronger than those between countries (Taylor and Bradley 1997; L´opez-Bazo et al. 2002: 365; Patuelli 2007: 4). Generally, the regional labor market is shaped by the interaction of labor supply and labor demand following a wage-setting mechanism. Because the labor market institutions are common within a country, the functioning of the regional labor market is highly affected by the local (region-specific) factors that affect demand and supply of labor. There are two main approaches that explain the causes of regional unemployment differentials: disequilibrium and equilibrium models of the regional unemployment (Filiztekin 2009: 869-870). Marston (1985) defined heterogeneity in the spatial distribution of unemployment as a disequilibrium phenomenon. Disequilibrium models of the regional unemployment point out that all regions converge to the same competitive equilibrium. However, because of the slow operation of the adjustment mechanism, variations are quite persistent. Therefore, before the convergence process is completed, the frequency of persistent variations might cause unemployment rates to differ across regions for long periods. Another explanation to why certain areas have different unemployment rates is based on the different endowments of regions. A steady-state relationship in unemployment rates across regions is related to endowments of regions. Because each region has different endowments, the spatial distribution of unemployment is not homogeneous (L´opez-Bazo et al. 2005: 309). On the contrary, if the endowment remains stable, the distribution of unemployment does not change. In spatial equilibrium models, while utility across areas for homogeneous labor must be uniform and thus no incentives to migrate, it is proved that high unemployment differences are compensated by higher real wages or regional amenities. In these models, ceteris paribus, a positive relationship is observed between the regional unemployment and the real wages as well as regional amenities (Molho 1995; Badinger and Url 2002: 978). In other words, in order to create zero migration equilibrium in the labor market, high risk of unemployment is compensated by higher real wages or regional amenities. On the contrary, theories related to job research also put emphasis on the effect of real wages on the regional unemployment but in a negative relationship perspective (Badinger and Url 2002: 978). Thus, equilibrium models of the regional unemployment suggest that there can be different steady-state levels of unemployment rates for each region. The convergence of all regions to the same competitive equilibrium is not necessary (Filiztekin 2009: 870).

In this context, the determinants of the regional unemployment have been discussed in detail in the literature (Molho 1995; Martin 1997; Taylor and Bradley 1997; Overman and Puga 2002; Badinger and Url 2002; Elhorst 2003; L´opez-Bazo et al. 2002, 2005; Filiztekin 2009). Empirical literature on regional unemployment differentials provides estimates of the effects of several variables on the unemployment of the representative region considering local area characteristics, personal characteristics of local population, and local demand variables (Molho 1995). According to Elhorst (2003), taking into account the Blanchard–Katz approach that is proposed by the most extensive model of the regional unemployment, there are three are reasons affecting the uneven distribution of unemployment from a regional perspective. The first reason is the magnitude of regional differences between regions within countries. The second reason is the insufficient explanation of the existence of unemployment disparities in macroeconomic models. Because most macroeconomic studies explain that the differences in labor unemployment disparities between countries are different labor market institutions; however, the existence of the common labor market institutions within a country cannot explain the regional issues (Filiztekin 2009: 864). Finally, the third reason explains that the unemployment differentials suggest inefficiency in the economy.

Elhorst (2003) provided a comprehensive review on unemployment differentials in the European countries and the United States. The factors that affect the regional unemployment are listed as follows: the natural change in the labor force, the participation rate, migration, wages, employment growth, market potential, the educational attainment of the population, the degree of unionization, and the industrial mix. To control the industrial mix, L´opez-Bazo et al. (2005: 310) included more sectoral disaggregation such as the shares of employment in energy and the construction- and market-oriented services. Moreover, additional variables such as transaction costs, unemployment benefits, regional social assistance plans, regional amenities (such as weather and climate conditions), and job access indicators were also included in the models (see Badinger and Url 2002 for further details).

Although several variables discussed in the previous studies can be used to explain the regional unemployment disparities, the significance and the extent of these variables are important for explaining unemployment differentiates within a country. In this study, the empirical model of the regional unemployment is based on both the equilibrium and disequilibrium variables. Moreover, the expected signs of the coefficients on the explanatory variables are contradictory because of the different theories of the regional unemployment. The factors finally used in this analysis are as follows:

Taking into account the disequilibrium effects on unemployment rates, employment growth rates (EMPGR) are included. Because additional jobs decrease the unemployment rate, a negative relationship is expected between the employment growth and the unemployment rate. However, a reverse relationship is predicted by Harris and Todaro (1970) considering induced urban–rural migration (L´opez-Bazo et al. 2005: 310). In addition, to control the variation in the labor demand, the growth rate of working age population (WAP) is included in the model. A positive relationship is expected between the regional unemployment and the growth rate of working age population.

Because of the market equilibrium effect and labor demand, the share of agriculture in employment (%AGR) and the share of manufacturing in employment (%MANU) are included to control the industrial mix. Although Elhorst (2003) pointed out the unclear effect (sign) of the variables, a negative relationship is expected between the employment share of the aforementioned sectors and the regional unemployment rate. However, while a lower unemployment rate is expected in the regions that are specialized in growing industries and agglomeration economics, a higher unemployment rate is expected in the regions that are specialized in declining industries.

The labor supply of a region is certainly affected by the structure of the population. Thus, a set of variables included to control the demographic effects on the regional unemployment are the share of young population (aged between 15 and 24 years) in the total working age population (aged between 15 and 64 years) (YOU). Turkey that has a higher share of youth population than the EU average also surges a significant amount of young population into the labor market. Especially, the financial crisis of 2008 has affected the youth in Turkey in the same way as in most of the EU countries. The young unemployment rate is also higher than the aggregate unemployment in both Turkey and the EU. In 2012, it was 17.5% and 24.9%, respectively (World Bank 2013). Thus, the different youth unemployment rates across regions are expected to affect the regional equilibrium unemployment. Because of the inadequate and sluggish job creation rate of the economy, the regions or provinces with a larger share of young population are expected to observe a higher unemployment rate. As a result, a positive relationship is expected between the employment share of young population and the regional unemployment rate.

Moreover, additional variables are included into the regression to control local area characteristics. In this context, labor force participation (LFP) is an important indicator. Although increased LFP is expected to lead higher unemployment rates, Elhorst (2003) pointed out a different opinion about the effect of LFP on unemployment because of a simultaneous work of several contradictory mechanisms. In this context, male (LFP-MAL) and female (LFP-FEM) participation rates were considered separately.

The LFP rate, especially of women, is an important determinant of labor supply both at the regional and national levels. LFP-FEM is thought to be lower in regions that have high unemployment. This participation behavior would reduce unemployment rate differentials relative to disparities in employment conditions between different areas (OECD 2013: 96).

Moreover, the decision of women to participate into the labor market is also affected by business cycles more than male participation (L´opez-Bazo et al. 2005: 310). While female participation tends to increase significantly, there is a decrease in a situation of high unemployment. On the contrary, the situation of high level of unemployment also increases female participation as an 'added worker effect.' On the other hand, Turkey has one of the lowest female participation rates in the EU: in 2012 it was 51.4% in EU and 29.4% in Turkey. In Turkey, the female labor force participation rate (29.4%) is far below than men (70.8%). The low female labor force participation rate is the much-debated and important issue of the Turkish labor market. Although the increase in the female LFPR is expected in the future, the labor force participation of women in Turkey is affected by many factors. In addition to cultural effects and gender inequalities, it is also affected by rural–urban migration, gender discrimination in the labor market, low educational attainment, and lack of skills and competence. Generally, most of the women are employed in agricultural or informal sector and are considered unpaid family workers in agriculture dropout of labor force in the cities (Ercan 2007: 10).

Finally, a set of variables was included to control the educational attainment. Human capital that includes skills and education is one of the significant factors that determine the adaption of an economy to ongoing changes in the production (L´opez-Bazo et al. 2005: 310). A negative relationship is expected between the educational attainment of workers and the unemployment rate. Higher demand is expected for high-skilled workers because high-skilled educated workers are very likely to be more efficient in job search, have lower probability of lay off, are more productive, and able to adapt rapidly to changing work environments. Education helps create employable individuals and it causes positive externalities (Ercan 2007: 26). In Turkey, the duration of formal education has changed over the decades; while the period of compulsory education was five years until 1997, it was increased to eight years in 2012; after intense debates, the period of compulsory education was further extended to 12 years dividing it into a three-tier system. To control human capital in each region, the shares of working age population primary level graduates (PRIM) as low skilled and the shares of working age population tertiary level graduates (TERT) as high skilled were included in the model.

Thus, the spatial model to be estimated can be expressed as follows:

$$\beta_1 LFPm_{ti} + \beta_2 LFPf_{ti} + \beta_3 Young_{ti} + \beta_4 Agr_{ti} + \beta_5 Man_{ti} + \beta_6 Primary_{ti} +$$
$$rtiary_{ti} + \beta_8 WAgr_{ti} + \beta_8 Empgr_{ti} + \varepsilon_{ti} \quad (1)$$

where $\varepsilon_{ti} = \alpha + B^{-1}u_t$, $B = (I_N - \lambda W)$, $i = 1, \ldots, N,\ t = 1, \ldots, T$ the dependent variable U_{ti} is the unemployment rate of the ith region at time t, I_N is the unit matrix, λ is the spatial autoregressive term, W is the spatial weight matrix, and ε_{ti} is the random disturbance term. As mentioned in the study of Filiztekin (2009: 872), it is difficult to measure the sign expectations of the coefficients on the explanatory variables due to the conflicting effects of different theories.

III. DATA AND EMPIRICAL MODEL

In this section, the empirical model (1) is used to estimate the impact of the disequilibrium and equilibrium variables on the regional unemployment rates. Moreover, the significance of spatial interaction of unemployment disparities is investigated. In this context, a panel regression model is fitted to the data from 2008 to 2012 for the 26 NUTS 2 level regions of Turkey. Several variables proposed in the literature are considered, which affect the level of the regional unemployment. In this study, the variables are selected according to the availability of data at the level of 26 regions for the entire period under analysis and according to the proposal of Filiztekin (2009). Therefore, we were not able to include factors such as the regional wages, real labor costs, and population density due to the lack of data. All variables used in the analysis are taken from Turkish Statistical Institute (TURKSTAT) household labor force statistics.

Interaction between locations can be analyzed considering the following two issues: 'spatial dependency' and 'spatial heterogeneity.' Spatial dependency is the interaction of a location in space to its adjacent location or locations. This interaction is described as 'spatial lag model' that indicates the relationship between dependent variables and 'spatial error model' that indicates the relationship between error terms. Spatial variation is the non constant variance of the spatial data from one location to another. The adjacent relationship between locations is indicated by a spatial weight matrix. In this study, two separate models are estimated by constructing two different spatial weight matrices for each of them. The spatial weight matrix is the fundamental tool used for representing the spatial connectivity between regions. First, the spatial weight matrix is based on constructing contiguity (common boundary). The spatial weight matrix is constructed using the neighborhood border, namely, if two locations are neighbors (share a border) it takes the value of one, if not it takes the value of zero and the rows are standardized. Second, the spatial matrix is constructed according to the distance (distance band), the so-called k-nearest neighbors.

The general form of the k-nearest neighboring weight matrix is defined as follows:

$$w_{ij}(k) = w(k)^*_{ij} / \sum w(k)^*_{ij} \quad with \quad w(k)^*_{ij} = \begin{cases} 0 \quad if \quad i = f \\ 1 \quad if \quad d_{ij} d_i(k) \\ 0 \quad if \quad d_{ij} > d_i(k) \end{cases} \tag{2}$$

where d_{ij} is the great circle distance between the regional centroid and $d_i(k)$ is a critical cutoff distance defined for each region i. $d_i(k)$ is the th-order smallest distance between regions i and j so that each region i has exactly neighbors. Therefore, in this analysis we considered two-nearest neighbor weight matrix *W*(2) to check for the robustness.

While neglecting the spatial dependence structure causes biased and inconsistent estimates, ignoring the spatial error leads to precision problems but not biased estimation. Spatial error indicates the variables that are not included in the model. In other words, it is the identification error of the model. The decision of how spatial dependency is included in the model is given by using a Lagrange multiplier (LM) test. LM tests provide a good guide to decide which specification between spatial error and spatial lag is the most appropriate. Then, Bera and Yoon (1993) proposed a modification of the LM test that is robust like that of Anselin (1988). After the widespread use of the spatial effects in panel data analysis, Anselin et al. (2006) developed these tests for panel data analysis.

Fixed effects and random effects models are discussed during the study of panel data analysis. Unobservable effects that cause model specification errors when not included in the model are taken as fixed, and are defined as 'fixed effects models.' On the other hand, 'random effects models' are taken when unobservable effects are included in the error term of the model. The unobservable effects are related to the independent variables in the fixed effects model, whereas it is not the case for the random effects model. If there is a relationship between independent variables and the error term, the estimates that are obtained from the fixed effects models will be biased and inconsistent. Because there is no such relationship in the random effects model, the estimation results provide the best unbiased estimators. These estimators are consistent and asymptotically efficient. The best estimators are identified by using the Hausman (1978) and Baltagi (2008) tests.

Because of spatial effects and inclusion of unobservable effects in the model, the following models and estimation methods are used for estimates.

Table 1. *Spatial Panel Data Models and Estimation Methods*

	Model		Estimation Method
Fixed Effects	Spatial Lag	$Y_t = \rho W Y_t + X_t \beta + \mu + \varepsilon_t$ $E(\varepsilon_t) = 0 \quad E(\varepsilon_t \varepsilon_t') = \sigma^2 I_N$	Maximum Likelihood Estimator (MLE)
	Spatial Error	$Y_t = X_t \beta + \mu + \phi_t$ $\phi_t = \lambda W \phi_t + \varepsilon_t\ ,\ E(\varepsilon_t) = 0$ $E(\varepsilon_t \varepsilon_t') = \sigma^2 I_N$	
Random Effects	Spatial Lag	$y_t = \rho W_N y_t + x_t \beta + \varepsilon_t$ $\varepsilon_t = \alpha + u_t$	Generalized Least Squares (GLS)
	Spatial Error	$y_t = x_t \beta + \varepsilon_t \quad \varepsilon_t = \alpha + B^{-1} u_t$ $B = (I_N - \lambda W)$	

Panel data analysis provides us to determine the observed changes both across the regions and through the years. Firstly, according to the contiguity-based spatial weight matrix, the spatial dependency is tested by using the LM test. Both Lagrange multiplier test for spatially lagged endogenous variable (LM-LAG) and Lagrange multiplier test for residual spatial autocorrelation (LM-ERR) rejected the null hypothesis of 'there is no spatial dependence.'

Secondly, according to the two-nearest neighbor weight matrix, both LM-LAG and LM-ERR test results are rejected. However, the test results of LM-LAG (t = 8.5437, p = 0.003) are more powerful than the test results of LM-ERR. According to the two-nearest neighbors, spatial dependence is included as spatial lag in the model. This outcome indicates that a one unit change in the dependent variable in a region is affected by the changes of its neighbors (two-nearest neighbors). Consequently, if the unemployment rate of the neighborhood increases or decreases, the unemployment rate of the region also increases or decreases.

Both the test results are found positive and significant, indicating the presence of spatial autocorrelation that is shown in Table 2. However, because the LM-ERR test results rejected the null hypothesis more precisely than the LM-LAG test results, with the value of 8.986 and significant at 5% by a t-test ratio, spatial dependence is included in the model as a spatial error. This implies an identification error in the model because spatial dependence is neglected in the model and thus it is included in the error term of the model. According to the contiguity-based spatial weight matrix model, after the results of the Hausman test (Hausman test statistic: 1.9516, p-value = 0.9967 with 5% critical values), the estimation of the random effects model is decided when unobservable variables are included in the model error term and are not related to independent variables. This indicates that changes occur in the regions or through time but not if the model is random. According to the LM and Hausman tests results, the estimation of the random effect spatial error model is decided by the contiguity-based spatial weight matrix. According to the two-nearest neighbor spatial weight matrix model, the LM and Hausman tests results of the estimation of fixed effect spatial lag model are decided.

IV. ECONOMETRICS RESULTS

The estimation results of panel ordinary least squares (OLS) and panel random effects models without spatial effects are shown in Table 2. Based on the LM tests, there is a significant spatial dependence in the set of residuals that is found in the model, thus the estimation results of spatial effects model with both contiguity and two-nearest neighbor weight matrices are provided in the third column of Table 2.

Table 2. *Regression Results with Contiguity and Two-Nearest Neighbor Weight Matrices*

Spatial weight matrix	Contiguity (Border Neighbor)			2-Nearest Neighbors W(2)		
	OLS	Panel Random Effects	Spatial Panel Random Effects	OLS	Panel Random Effects	Spatial Panel Fixed Effects
LFP-MAL	0.254 (0.015)*	0.419 (0.002)*	0.376 (0.000)*	0.254 (0.015)*	0.419 (0.002)*	0.250 (0.008)*
LFP-FEM	0.027 (0.742)	0.044 (0.688)	0.081 (0.380)	0.027 (0.742)	0.044 (0.688)	0.045 (0.563)
YOU	0.361 (0.004)*	0.378 (0.006)*	0.360 (0.003)*	0.361 (0.004)*	0.378 (0.006)*	0.309 (0.006)*
%AGR	-0.081 (0.005)*	-0.041 (0.165)	-0.052 (0.003)*	-0.081 (0.005)*	-0.041 (0.165)	-0.069 (0.010)*
%MANU	-0.020 (0.459)	0.019 (0.550)	0.008 (0.698)	-0.020 (0.459)	0.019 (0.550)	-0.018 (0.477)
PRIM	-0.392 (0.011)*	-0.499 (0.016)*	-0.523 (0.002)*	-0.392 (0.011)*	-0.499 (0.016)*	-0.348 (0.016)*
TERT	-0.830 (0.007)*	-0.721 (0.021)*	-0.789 (0.002)*	-0.830 (0.007)*	-0.721 (0.021)*	-0.786 (0.006)*
WAP	-0.031 (0.818)	-0.134 (0.326)	-0.054 (0.673)	-0.031 (0.818)	-0.134 (0.326)	-0.069 (0.615)
EMPGR	0.008 (0.838)	-0.016 (0.647)	-0.046 (0.175)	0.008 (0.838)	-0.016 (0.647)	0.000 (0.984)
Constant	9.793 (0.250)	-5.004 (0.603)		9.793 (0.250)	-5.004 (0.603)	
Spatial Autocorrelation			0.352 (0.000)*			0.271
R-squared	0.537	0.517	0.573	0.537	0.517	(0.000) 0.625
LM-ERR		8.989 (0.003)*			7.719 (0.005)*	
LM-LAG		8.577 (0.003)*			8.543 (0.003)*	

Note: Significant at * 5 % in p-values.

Out of the nine variables; demographic variables, industrial mix and educational attainment across regions seem to explain most of the regional unemployment rates for 26 regions, whereas disequilibrium variables do not seem to affect the regional unemployment levels in the period from 2008 to 2012.

Among the set of demographic variables, only coefficients for participation rates of men (LFP-MAL) were found significant. The positive sign for the coefficient indicates that the growth of labor force was not fully compensated for the growth of jobs and thus there is an increase in the unemployment rates. In recent years, especially, jobless growth has been one of the debatable issues of Turkish economy. The positive economic growth could not create adequate job opportunities. Turkish economy was back to growth on an annual basis in the last three years after contraction of 2009. However, the unemployment rate remained high. Moreover, because of the recovery effects of the global financial crisis, the return of the desperate workers to the labor market could increase unemployment rates. The effect of the female labor force participation rate (LFP-FEM) on the regional unemployment rate is found insignificant. This can be related to the very limited number of females participating in labor force currently. Similarly to this theory, the share of young population (YOU) was found significant and positive confirming that regions with larger shares of youth population were likely to have high unemployment rates. Because of significant young population in Turkey, job creation was unable to catch up with the young population growth in the labor market and thus there was an increase in the unemployment rate.

Regarding market equilibrium variables, only the coefficient of the share of agriculture in employment (%AGR) was found significant. Regions with larger shares of agricultural sector were likely to have low unemployment rates. As Filiztekin (2009:871) stated that Turkey is on a transition path from an agricultural society into an industrialized one, the role of industrial mix is expected to be significant. Although Turkey's production field is ongoing industrialization and transformation from agriculture to manufacturing, in 2013 Turkey still had a high employment rate in the agricultural sector (23.5%) than in industry (19.1%), construction (7.6%), and services (49.8%). Moreover, agricultural sector commonly involves low educated and unskilled labor force, especially female agricultural unpaid family workers. Although the share of manufacturing in employment (%MANU) is expected to affect the unemployment rates, because of the many new industrial centers emerged in the last couple of decades, we could not find a significant effect in our model. This is probably due to the construction of the NUTS 2 level regions in Turkey. Because NUTS 2 level is composed of provincial level (NUTS 3), some provinces are industrial centers and growth poles grouped under the same region with less industrialized or agriculture- or tourism-based provinces such as the construction of TR21 Tekirdağ, TR32 Aydın, and TRC1 Gaziantep regions. In this case, the share of manufacturing in employment (%MANU) does not affect the regional unemployment levels. The effect of this variable can be seen more obviously in a provincial study.

The variables that measure the educational attainment are found to be statistically significant. The negative coefficient for these variables indicates that both low-skilled and high-skilled workers affect the regional unemployment rate. These results also confirm the sectoral transformation of Turkish economy. On the one hand, the traditional and less skilled sectors are common in Turkish industry and the low educated workers (the shares of primary school graduates (PRIM)) are especially employed in the labor-intensive sectors in which Turkey has still high comparative advantage in the international markets such as textile and clothing. On the other hand, along with the ongoing sectoral changes toward more capital and technology intensive ones, such as automotive and machine industries, and the effect of skill-based technological changes require high-skilled workers (the shares of tertiary level graduates (TERT)) in Turkish industry. Moreover, increasing educational levels affect both wages and participation rates positively (Ercan 2007: 29). The increase in the compulsory educational level in Turkey can be the reason for more high-skilled workers in the employment. In Turkey, as the educational level increases the LFP rate increases significantly. In 2013, while the LFP rates of illiterate and less than high school were 19.7% and 47.6%, respectively, the LFP rate of higher education was 79.1% (Turkstat 2014). More educational attainment of workers reduces unemployment rates and thus the negative effect of higher education on unemployment differentials is found particularly strong.

In addition, the significance of spatial coefficient observed over the period is another important result taken from estimates. Most of the previous empirical evidence validates spatial effects in the regional or provincial distribution of unemployment rates within a country (López-Bazo et al.

2002; Patuelli et al. 2012). The results of the analyses show that it is important to consider that regions are not isolated entities and that there is a significant spatial interaction among regions. Therefore, a spatial relationship among regional unemployment disparities in Turkey is tested by using LM tests. Then, the spatial autocorrelation is found according to the test results of LM-LAG and LM-ERR. Because of more precise results of LM-ERR, spatial dependence is included in the model as spatial error. As a result, a positive spatial correlation is observed among the regional distribution of unemployment rates in Turkey.

V. CONCLUSION

In this study, regional disparities in unemployment rates in Turkey at 26 NUTS level 2 regions are analyzed. A panel data technique is applied for exploring the determinants of the regional unemployment. In addition, special attention is paid to analyze the spatial dimension of the phenomenon by constructing two different spatial weight matrices. The time period ranges from 2008 to 2012.

The persistent unemployment and its regional aspects will continue to be major concerns in Turkey though there is a wide development gap between administrative and geographical regions. In Turkey, the regional unemployment rates vary between 4.1% and 18.8%.

As a result, causal analysis indicates that the unemployment differences are, in a large extent, explained by using the demographic variables (male LFP rate and the share of young population), economic structure (the share of agriculture), and educational attainment. Turkey is still undergoing a demographic transition, i.e., a surge of young people into market. That is, the rural-agricultural society is being replaced by an urban-industrial sector as Filiztekin (2009: 877) stated.

Consequently, in spite of high economic growth rates in last few years and inadequate job creation, the positive relationship between the coefficients of male LFP rate and the share of young population highlights jobless growth of Turkey. The significant and negative coefficient of employment in the agricultural sector shows decreasing regional unemployment rates despite the fact that its share in the total economy is declining. The share of agriculture is still high in the employment rate though Turkey's production field is undergoing industrialization and transformation from agriculture to manufacturing. Moreover, the unemployment differences are explained by the educational attainment. The negative coefficient for these variables indicates that both the low-skilled and high-skilled workers affect the regional unemployment rate. These results also confirm the sectoral transformation of Turkish economy. The high-skilled human capital plays a more important role in shaping the distribution of local unemployment though the traditional and less skilled labor-intensive sectors affect the reduction of unemployment rates. Moreover, a positive spatial correlation is found among the regional distribution of unemployment rates in both contiguity and two-nearest neighbor W(2) spatial weight matrices.

In conclusion, in the light of the analysis of this study, policy makers should pay attention to develop policies that target the increase in the educational attainment and to create new job opportunities to reduce the surge of population into the labor market, that is, to encourage regional incentives and to increase flexibility in the Turkish market.

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