Employment Growth in A Cross-Section of Turkish Districts: A Spatial Analysis

by

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This is to certify that I have examined this copy of a master's thesis by

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and have found that it is complete and satisfactory in all respects,
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To my parents

ABSTRACT

Researchers have been studying urban growth and its underlying factors for the last few decades. A considerable portion of this literature is devoted to understanding the role of human capital in the urban employment growth. An increasing interest in spatial econometrics, popularized by Anselin (1988) paves the way for new studies focusing on the spillovers among the urban areas. This paper contributes to the literature by studying the relationship between human capital and employment growth in Turkish districts over the period 1990-2000 using spatial econometric analysis. We employ a maximum likelihood approach since the data indicates spatial dependence in dependent variables which leads the biased and inconsistent OLS estimates. The results indicate that human capital stock and initial share of manufacturing in total employment is positively associated with employment growth. However, the determinants of the employment growth are not limited to local attributes only. Significant positive coefficient of spatial dependence variable suggests that employment growth in a district is positively related to human capital in its neighboring districts.

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Chapter 1

INTRODUCTION

Human Capital and City Growth

Reflecting the impacts of global crisis, Turkey's unemployment rate has jumped to all-time high figures in 2009. However, low unemployment rate is not a new concern to the country; indeed the number of employed people as a percentage of working age population in Turkey has been lower than in the EU for years. In 2000, the employment rate in Turkey was only 48.2 percent vis-a-vis 63.2 percent in the EU. The country has a relatively young population with high birthrate and eventually the population growth has outpaced the employment growth for decades. Furthermore, a large informal economy has resulted in a slow job creation, as explained in Turkish Labor Market Study of World Bank (2006). Another important reason for the low employment rate is low participation rate of urban women according to Taymaz and Ozler (2005). In addition to new labor market regulations that should be designated in order to create jobs, as the theory suggests realistic and permanent solutions can be achieved only by the increase in average human capital.

Employment concerns of the people also motivate internal migration. As Glaeser et al.(2005) argue for US, cities have more open economies than the countries in terms of mobility of capital, labor, and ideas. The argument is also true for Turkish cities but not applicable for Europe. However, first of all the term "city" should be defined. Gleaser (2004) highlighted that regional economists usually examine cities and metropolitan areas as the urban settlements. In Turkey, the definition of "province" is conceptually more similar to "provincial centre" and "district" to "city". In light of this assumption and since there is not a commonly agreed definition for city in the literature; the term "district" is used interchangeably with "city" in this study.

Much scholarly research has been devoted to explaining the relationship between human capital and the growth of the cities. The studies of Romer (1986), Jacobs (1968), Lucas (1988), Barro (1991) and Glaeser (2004) focused on the cities' roles on the knowledge spillovers. All these papers suggest that urbanization facilitates the quick move of the ideas. On the empirical side, most of the papers in the regional growth literature examine the impacts of human capital on income growth and population growth. However, Gleaser et al. (2005) suggest that qualitatively equivalent results can be obtained using employment growth instead of population growth. Besides, Gleaser (2004) also shows the co-movement of income and population. Hence, the results of regional growth models -whether they use population, income or employment growth as the primary measure of city growth- are consistent.

Many researchers have contributed to regional growth literature by testing these theories using data from various countries. For instance, Simon (1998) and Simon and Nardinelli (2002) find that American cities with higher average levels of human capital experience faster employment growth. Human capital generates faster growth of labor force in Australian cities according to Bradley and Gans (1998). Marlet and Woerkens (2004) argue that the presence of large creative class should be accounted as another important determinant of the employment growth in Dutch cities, since existence of high levels of an intellectual class with skills and creativity provides the atmosphere to commence new businesses.

The goal of this paper is to test if the theory can be applied to Turkish data. We use model proposed by Simon (1998) and examine the relationship between the human capital in 1990 and the employment growth between 1990 and 2000 in all 894 districts of Turkey.

Is the grass greener on the other side of the hill?

When it comes to the interaction of the cities, the "openness" brings the necessity of testing the employment spillovers across these urban areas. Any change in a district might be caused by both city-specific and neigboring cities' attributes. Particularly, since human capital is quite mobile compared to labor and physical capital, we expect to come across the knowledge spillovers among the cities. Therefore the supplementary part of this study poses the following question: Does the rain over the other side of the hill make the grass greener here? The answer would be "yes", if the gardens are spatially dependent. The spatial dependence among the variables in a cross-sectional analysis is analogous to the autoregressive process in time series context by replacing the serially dependent variables with the spatially dependent ones.

The increasing popularity of in urban and regional sciences has amplified the interest for the notion of “space”. For years, considerable research has been devoted to time series analysis; however less attention has been paid to spatial effects. Basically, spatial economics is a sub-field of economics (or econometrics) which focuses on the spatial interaction in variables. Recently, interest in spatial analysis seems to grow, as explained in Anselin (2006). There is no doubt that this literature will expand as more locational data and more efficient computational methods become available.

In general, two classes of spatial effects are examined in the regional economics models: spatial lag dependence and spatial heterogeneity (or spatial error model). Spatial lag dependence refers to spatial correlation in the dependent variable (analogous to AR process in time series context), whereas spatial heterogeneity stands for the correlation in the error term (analogous to MA process in time series context). Anselin (1988), Anselin and Florax (1995), Florax et al. (2003) and Anselin (2006) discuss the central methodological issues in spatial analysis.

Compared to traditional regional growth studies with no spatial specifications, fewer studies have focused on regional growth using spatial econometrics techniques. Among them, Lundberg (2006) finds spatial dependence in the error terms while examining the average income growth in Swedish municipalities during 1980s. However in China, a city’s per capita GDP growth is affected by the neighboring cities’ growth rates according to Pei (2007). When it comes to unemployment, Cracolici et al. (2007) show significant degree of spatial dependence in the unemployment rates of the provinces of Italy. Similar results are by Lopez-Bazo et al. (2002) for Spanish provinces. On the policy implication side, Franzese and Hays (2005) argue that spatial interdependence should be taken into account for supranational policymaking since their results indicate employment spillovers in the EU region.

In this paper, we test the model proposed by Simon (1998) using Turkish data and modify the model by introducing a spatially lagged dependent variable. Basically, we seek answers to questions: i) what are the determinants of the employment growth? ii) are the growth rates interrelated? The estimation procedure reaches to final hypothesis that districts with higher level of human capital, larger share of manufacturing in total employment and less distance to central province in 1990 experienced faster employment growth between 1990 and 2000 in Turkey. Besides, the spatial dependence in the employment growth rates is economically large and significant, suggesting that employment growth in a district is positively related to the employment growth rates of the neighboring districts.

The rest of the dissertation is as follows: section 2 presents a brief overview of the theory tested in this paper. Section 3 describes the data set and the weighting matrix derived in order to use in spatial analysis. Section 4 presents specification and estimation results. A final section concludes.

Chapter 2

THEORY

2.1 Human Capital and City Growth

In this study, the model developed by Rivera-Batiz (1998) and modified by Simon (1998) is tested with Turkish data. Simon (1998) contributed to the model by introducing a role for human capital through skilled labors. The studies assume that each city uses a Cobb-Douglas technology to produce a single final good which is exported at a constant price. The production is modeled as a function of land, labor, and a variety of intermediate services. The key feature of the model is that both skilled and unskilled labor are producing final goods, but services are produced only by skilled workers of monopolistically competitive firms using an increasing-returns technology.

The preferences of the workers are represented by a Cobb-Douglas utility function. The individual's utility depends on maximizing the consumption of two goods, an internationally traded consumption good and housing, with the budget shares of θ_1 and θ_2, respectively. Fundamentally, the model is set in order to examine the mobility of the workers across the cities.

In the light of these assumptions, the utility of a worker is:

$$ln\left(\frac{U_{j,t+1}}{U_{j,t}}\right) = \theta_1\left\{\left(-\delta+\gamma\frac{(1-\sigma)}{\sigma}\right)-\frac{\theta_2}{\theta_1}\right\}ln\left(\frac{L_{t+1}}{L_t}\right)+\theta_1\left(\frac{\beta+\gamma}{\sigma}\right)log\left(\frac{A_{t+1}}{A_t}\right) \quad (2.1)$$

In equation (2.1) L_t denotes for the total city employment at time t and β, δ and γ are the skilled labors' share, land's share and services' share of output of the final good, respectively. $log(A_{t+1}/A_t)$ denotes for the rate of technical change. The substitutability between intermediate services as a determinant of production is denoted by σ. Since it is safe to assume the first bracket on the right hand side of the equation as negative, the rate of utility growth is decreasing in employment growth and can be characterized as an increasing function of the rate of technical change.

Assuming the exogenous growth of labor and their movement across the cities, the growth rate and level of the utility should be same across the cities as general equilibrium and regional growth models suggest. Hence using equation (2.1), the employment growth can be designated as;

$$\dot{L_c} = \eta_{0c} + \eta_{1c}\dot{A} + \varepsilon_c \tag{2.2}$$

where η_{0c} is negative and η_{1c} is a positive function of average level of human capital in the city (HK_c). Note that higher β and higher γ separately indicate higher number of skilled workers and therefore higher average level of human capital in a city. Hence it can be thought that as long as technical change is positive, the employment growth is higher in the cities hosting more educated people.

Modifying the arguments by Lucas (1998) that the existing average level of human capital increases the rate of growth of knowledge, Simon (1998) divides the rate of knowledge change into two parts: city specific (localized) and nationwide:

$$\dot{A} = \dot{A_N} + \dot{A_c} \tag{2.3}$$

where subscript N and C represent nationwide and localized, respectively. Assuming that localized spillover is a linear function of (HK_c):

$$\dot{A_c} = \omega HK_c \tag{2.4}$$

If we replace equations (2.3) and (2.4) into equation (2.2), we have;

$$\dot{L_c} = \eta_{0c} + \eta_{1c}(HK_c)(\dot{A_N} + \omega HK_c) + \varepsilon_c \tag{2.5}$$

Hence employment growth in a city appears to be a positive function of human capital in that city, and both localized and nation-wide spillovers scale up this positive relationship. In accordance with the aim of this study, $\dot{A_N}$ is interpreted in the manner of knowledge change in neighboring cities rather than nationwide.

2.2 Spatial Dependence

2.2.1 Why spatial econometrics is used?

As summarized in a recent study of Anselin (2007), in the areas of real estate economics, environmental economics, public economics, and regional economics, increasing number of studies has been published in which spatial econometrics appears, especially after 2000. In many economic problems, when locational matters exist, scholars begin to use spatial econometrics. The most obvious example could be the one given by Bell and Bockstael (2000) who suggest that neighborhood attributes may be the determinant of housing values. In other words, the value of a house should be the combination of the values of the neighboring houses. Furthermore an attribute which is closer in distance is expected to contribute stronger than an attribute which is further in distance. That is to say, in a model of estimating the hedonic price structure of a house, the value which is a dependent variable may be the function of the values of the other houses which are also dependent variables, resulting to spatial dependence. On the other hand, the values of the houses in a neighborhood may also depend on neighborhood attributes which cannot be screened; resulting in spatially correlated errors. In matrix notation, these two most general classes of spatial dependence take the following forms:

Spatial lag model:

$$y = \rho W y + \beta X + \varepsilon \tag{2.6}$$

and, spatial error model:

$$y = X\beta + (I - \lambda W)^{-1}\mu \tag{2.7}$$

where W is an NxN spatial weight matrix of exogenously determined elements representing the spatial pattern. Hence this matrix has a key role in spatial models providing the spatial relations. A typical spatial weight matrix can be given by

$$\begin{pmatrix} 0 & d_{12} & d_{13} \\ d_{21} & 0 & d_{23} \\ d_{31} & d_{32} & 0 \end{pmatrix} \tag{2.8}$$

In this study, inverse distances between the districts are used in the spatial weight matrix (i.e d_{12} is the inverse distance between district 1 and district 2). Other schemes applied in the literature include inverse distances raised to some power, binary values representing spatially contiguous neighbors, lengths of shared borders divided by the perimeter, bandwidth as the n^{th} nearest neighbor distance etc. (Getis and Aldstadt, 2004).

Before implementing spatial techniques; we were expecting the existence of spatially lagged dependent variable. Assuming the positive relationship between human capital and district growth, a district with high human capital would create a different atmosphere not only in itself but also in its periphery and lead the emergence of new opportunities that bring new jobs. As Simon (1998) suggest, nation-wide spillover is expected to be significant as well as the city specific attributes. This interaction should become stronger as the distance between any two districts decreases.

2.2.2 Diagnostic Tests for Spatial Dependence in OLS Regression: Spatial Lag and Spatial Error Specification

Florax et al. (2003) suggest that in order to specify the spatial dependence and to estimate the model, the classical specification search strategy in spatial econometric modeling should be applied. They also show that this classical approach dominates all other methodologies (2003 and 2006). The steps are as follows:

1. The model is estimated by OLS.

2. The hypothesis of no spatial dependence is tested using Moran's I statistic. In matrix notation, Moran's I statistic is;

$$I = (N/S_0)(e'We/e'e) \tag{2.9}$$

   where e is a vector of OLS residuals, and $S_0 = \sum\sum w_{ij}$ is a standardization factor. Cliff and Ord (1972) found that the asymptotic distribution for Moran's I corresponds to a standard normal distribution, after subtracting the mean and dividing by the standard deviation of the statistic. Remember that spatial lag model is similar in structure to AR process of time-series context and spatial heterogeneity model is to MA process. Likewise, Moran's I is analogous to Durbin-Watson test for serial correlation.

A significant Moran's I statistic indicates a spatial correlation in the least-squares residuals. A significant result brings us to step 3; if not, the findings of OLS are accepted as the final results.

3. If Moran's I is significant (i.e. the model has a spatial dependence), Lagrange Multiplier Tests for spatial error and lag models are checked separately in order to understand which type of spatial dependence the data has.

   These LM tests take the following forms:

$$LM_{err} = [e'We/(e'e/N]^2/[tr(W^2 + W'W)] \tag{2.10}$$

$$LM_{lag} = [e'Wy/(e'e/N)]^2/D \tag{2.11}$$

   where $D = [(WX\beta)'(I - X(X'X)^{-1}X')(WX\beta)/\sigma^2] + tr(W^2 + W'W)$
   Note that, each of these LM statistics has an asymptotic $\chi_{(1)}$ distribution.

   - If LM_{err} is significant and LM_{lag} is not or if $LM_{err} \geq LM_{lag}$ while both of them are significant; the parameters should be estimated using maximum likelihood method for spatial error.

   - If LM_{lag} is significant and LM_{err} is not or if $LM_{lag} \geq LM_{err}$ while both of them are significant; the parameters should be estimated using maximum likelihood method for spatial lag.

If the data suggests spatial dependence in dependent variables (i.e. spatial lag) based on the classical specification search strategy above, OLS results are biased and inconsistent (Anselin,2006). We can show bias and inconsistency in a first-order spatial lag model for easiness of calculation (LeSage, 1998). First-order spatial lag model in matrix notation is;

$$y = \rho Wy + \varepsilon \tag{2.12}$$

where ε has a normal distribution with 0 mean and $\sigma^2 I_n$ variance. If we apply OLS to this model, the estimate for ρ becomes:

$$\widehat{\rho} = (y'W'Wy)^{-1}y'W'y \tag{2.13}$$

If we substitute the expression for y into equation (2.13) and take the expectation:

$$E(\widehat{\rho}) = (y'W'Wy)^{-1}y'W'(\rho Wy + \varepsilon) = \rho + (y'W'Wy)^{-1}y'W'\varepsilon \tag{2.14}$$

Since the term Wy is not fixed in repeated sampling the terms before ε cannot be eliminated and we cannot show that $E(\widehat{\rho}) = \rho$ in the presence of spatially dependent variable. This leads least squares estimates to be biased. Furthermore, because of the fact that probability limit of y'W'ε is not zero, OLS estimates are also inconsistent (LeSage,1998).

2.2.3 Maximum Likelihood Estimation for Spatial Lag Models

If Moran's I test indicate spatial lag dependence in the data, the model can be estimated through maximum likelihood estimation method for lag models. The log-likelihood for lag models is;

$$L = -(N/2)(ln 2\pi) - (1/2) ln\,|\Sigma_\Theta| + ln\,|I - \rho W| - (1/2)(y - \rho Wy - X\beta)'\Sigma_\Theta^{-1}(y - \rho Wy - X\beta) \tag{2.15}$$

where the log-Jacobian term, $ln\,|I - \rho W|$ is added in order to prevent the endogeneity in the Wy term (Anselin,2006).

Chapter 3

DATA

The term “city” is commonly used to describe a large urban settlement. However, especially in English, there is not a universally agreed definition of the term city and the term refers to different concepts in different countries. In this study districts and provinces, which are both referring to more specific concepts in Turkey (“ilçe” and “il” in Turkish, respectively), are used for the classification purposes in order to avoid ambiguity. The 81 provinces of Turkey are divided into several districts or in another words, a district is an administrative subdivision of a province in Turkey. The common characteristic of these districts is that they have municipalities. A district may include both urban and rural areas, however this study uses data on only urban areas in order to decrease the impact of the large informal economy. Although there were 923 districts as of the year 2000, 894 of them were chosen as application area since the ones which were not classified as “district” in 1990 population census are dropped.

The data is obtained from Turkish Statistical Institute. It includes the following variables at the district level:

- Working age, labor force, unemployed and employed population
- Literacy rate, shares of primary school, secondary school, high school and college graduates
- Shares of manufacturing, agriculture, mining and construction sectors in total employment
- Distance to central province

In Turkey a Regional Classification which meets NUTS criteria has been defined. In this classification, there are 12 NUTS-1 regions, 26 NUTS-2 sub-regions and 81 NUTS-3 provinces. Since neighboring provinces which are similar by their economic, social and geographic characteristics are grouped as NUTS-1 regions, they appear to be suitable candidates for explaining the regional differences. Hence this study uses 12 NUTS-1 regions as regional dummies. The urban agglomeration characteristics, the size of the area, and the number of cities in these regions differ from each other.[1]

Table (6.1) displays summary statistics. Gleaser (2004) argues that growth economists and regional economists should focus on simple regressions between latter changes and initial conditions rather than regressing changes on changes if functional forms are not completely known and there are possible omitted variables. He shows Barro's (1991) study as a proper example for this modern, safe and simple approach. Thus, 1990-2000 employment growth is regressed on 1990 starting variables in this study.

The variables and percentages used in this study is calculated over the population aged between 15 and 64. There is only 2.2 percent of employment growth, comparing to 11.2 percent of labor force population growth on average in 894 Turkish districts, parallel to the dynamics of Turkish labor market that have been already discussed in the first chapter. Education variables are also not surprising. Highest percentages of working age population with a college degree or better are obtained by Çankaya, Ankara, Beşiktaş, İstanbul and Çesme, İzmir, respectively. Average Turkish district is 60.5 km far from the central province and 13.2% of the workers are employed in manufacturing industry. Furthermore, share of workers in manufacturing sector has a large standard deviation, reflecting the different sectoral characteristics of the districts. For example, around half of the employed population is in the manufacturing industry in Aliağa, İzmir, where Petkim, one of the largest companies and the leading petrochemical company of Turkey is located. On the other hand, only 0.17% of the working population in Çukurca, Hakkari, a district with no large or mid-sized factory but some ateliers, is employed in the manufacturing sector.

Additionally, a weighting matrix is derived in order to use in spatial analysis. This matrix, obviously, has a dimension of 894 x 894 and it includes the inverse distances between any two districts. Although distance variable is calculated as air distance; it is the best proxy for the real distance regarding roads. These distances are calculated by the Haversine

[1]These level-1 regions are: İstanbul, Batı Marmara, Ege, Doğu Marmara, Batı Anadolu, Akdeniz, Orta Anadolu, Batı Karadeniz, Doğu Karadeniz, Kuzeydoğu Anadolu, Ortadoğu Anadolu and Güneydoğu Anadolu. For example, İstanbul region includes only one province, İstanbul; however Batı Karadeniz region is composed by 3 sub-regions and 10 provinces.

formula.[2] An inverse-squared distance matrix may be used as an alternative model since Getis and Aldstatd (2004) argue that $1/d$ and $1/d^2$ respond more effective than any other weight matrix as measures of autocorrelation.

[2] See R.W. Sinnott, "Virtues of the Haversine", Sky and Telescope, vol. 68, no. 2, 1984, p. 159 for more details.

Chapter 4

ESTIMATION AND RESULTS

Simon (1998) estimates a linearized version of equation (2.5). In this study, a similar equation is estimated in order to test the model for Turkish data. Simon also includes family income in order to control the impacts of transitory differences in factor prices. The equation we estimate is the following:

$$EMPGR = a_0 + a_1 HK + a_2 WA + a_3 SMAN + a_4 DIST + a_5 REGION + \varepsilon \qquad (4.1)$$

EMPGR is the difference in natural logarithms of 2000 and 1990 employment. HK is the percentage of the population (aged ≥ 15 and ≤ 64) with a high school degree or better. In line with the theories on human capital and growth, the coefficient of HK is expected to be significant and positive. Natural logarithm of 1990 working age population, WA is included into the regressions in order to capture the negative externalities of larger cities such as crime and commuting time as Simon (1998) suggests. Hence the coefficient of WA is expected to be negative. To control the city-specific industrial orientation, the share of labor force in manufacturing industry (SMAN) is used. Additionally, DIST is the distance to the central province and its coefficient is expected to have a negative sign. REGION stands for the 11 regional dummies (NUTS-1 level).

In light of the specification strategy explained above, firstly simple linear regression is applied to the equation (4.1). Then using OLS residuals and the weight matrix including the inverse distances between districts, spatial dependence is tested by Moran's I statistic. The statistic indicates spatial dependence in the model, as expected. Hence Lagrange Multiplier tests are applied in order to specify the type of the dependence. The results of Moran's I and LM tests are reported in table (6.2). Since Lagrange Multiplier for spatial lag dependence is significant at 1% level while the multiplier for spatial error dependence is not, the model is estimated using maximum likelihood estimation for lag models. Remember that the estimated equation transforms into as follows;

$$y = \rho W y + \beta X + \varepsilon \qquad (4.2)$$

where X is the own city attributes which was already appeared in equation (4.1) and ρ is the coefficient of spatially lagged dependent variables.

Table (6.3) shows the maximum likelihood estimates for the model. As the theories suggest, the coefficient of human capital is positive and significant at 1% level. Hence, as in US that is tested by Simon (1998), districts with higher average levels of high school and college graduates in 1990 experienced faster employment growth between 1990-2000 in Turkey. The coefficient of spatially lagged variable, rho is also positive and significant at 1% level indicating that employment growth in a district is appeared to be a function of both own-district and periphery human capital. This is also evidence that any district in where a university locates may create a good atmosphere for the entrepreneurs in the nearby districts. Alternatively, as in Simon (1998), high level of human capital in a district may attract the skilled population from further districts and may also redistribute the population within the neighboring districts. Such an interaction among the districts may be attributable to increasing mobility of labor, capital and ideas after 90s in Turkey.

The logarithm of the working age population is significant at 5%; however surprisingly positive. Therefore, the results indicate that agglomerative effects outweighed the congestion effects. The coefficient of the distance to central province is negative and significant. It may be argued that a district experiences slower employment growth as it locates far from the central province, a situation that increases communication and transportation costs. Estimation results also suggest that the coefficient of manufacturing's share in total employment is positive and significant at 1%. This result opposites Gleaser et. al's (2005) findings since they argue that income and population growth are negatively related to the share of employment initially in manufacturing. Their hypothesis is based on the observation that people leave the manufacturing cities and migrate to suburban areas in US in order to avoid negative effects of factories. However, Turkey has been experiencing a transition era from agricultural to industrial society for years. Hence the positive coefficient may be due to manufacturing sector's more tendency to create jobs comparing to agriculture and also due to the immigration of the people from agricultural cities to industrial ones. Finally, regional dummies are almost insignificant (10 out of 11), therefore regional differences do not tip the balance of the employment growth rates. Although regional dummies are expected to explain part of the variation in the employment growth rates of the districts in

Turkey, insignificat coefficients of them indicate that the number of employed population can be raised by increasing human capital in the particular district independent from its region. In other words, the impact of establishing a new university on the employment growth rate is expected to be almost same in any two districts.

Chapter 5

CONCLUSION

This paper examined the dynamics of employment growth in 894 districts of Turkey between 1990 and 2000. Using the model proposed by Rivera-Batiz (1998) and modified by Simon (1998), the relationship between initial human capital and the following employment growth was tested by controlling the initial population, initial manufacturing's share of total employment, regional dummies and distance to central province. Since least-squares estimates are biased and inconsistent due to spatial dependence among the dependent variables; maximum likelihood estimation methods are used instead. A positive relationship has been found between employment growth and human capital, as the theories suggest. Moreover, a significant and positive relationship was found in the employment growth rates of the districts, indicating that employment growth of a district is a combination of the initial levels of human capital in the other districts. Such interdependency is expected for much the same reason that a city is affected from its neighboring cities due to the mobility of labor and ideas. This interdependency gets stronger as the distance between the districts decreases (i.e. the corresponding value in the weight matrix increases). There is also evidence that manufacturing cities experienced faster employment growth. Working age population and proximity to the central province are the other determinants of district employment growth.

The results of this study indicate some directions for future research on this topic. Shares of secondary school, high school and college graduates could be regressed on the employment growth in order to specify the distinct effects of education variables. Furthermore, the model might be set separately for male and female population in order to control gender-specific factors.

BIBLIOGRAPHY

[1] Anselin,L.(1988). *Spatial Econometrics: Methods and Models.*Kluwer,Dordrecht.

[2] Anselin, L., (2006). Spatial Econometrics. In Millis, T. and Patterson, K., editors, *Palgrave Handbook of Econometrics: Volume 1, Econometric Theory,* pages 901-969. Palgrave Macmillan, Basingstoke.

[3] Anselin,L. and R.Florax, (1995). L. Anselin and R.Florax(eds.), *New Directions in Spatial Econometrics.*Berin: Springer-Verlag,3-18.

[4] Barro,R.,(1991).Economic Growth in a Cross-Section of Countries. *Quarterly Journal of Economics.* Vol.106 (407-444).

[5] Black, D. and V.Henderson, (1999). A Theory of Urban Growth. *The Journal of Political Economy.* Vol.107(2)

[6] Bell, K.P. and N.E. Bockstael. (2000). Applying the Generalized Method of Moments Approach to Spatial Problems Involving Micro-Level Data. *Review of Economic and Statistics* Vol.82(1) (72-82).

[7] Bradley, R. and J.S.Gans,(1998).Growth in Australian Cities. *The Economic Record.* Vol.74 (266-278).

[8] Cracolici,M.,M.Cufarro and P.Nijkamp, (2007). Geographical Distribution of Unemployment: An Analysis of Provincial Differences in Italy.*Tinbergen Institute Discussion Paper.* (065-3).

[9] Florax, R., H.Folmer and S.J.Rey, (2003). Specification Searches in Spatial Econometrics: The Relevance of Hendry's Methodology. *Regional Science and Urban Economics.* Vol.33(557-579).

[10] Florax, R., H.Folmer and S.J.Rey, (2006). A Comment on Specification Searches in Spatial Econometrics: The Relevance of Hendry's Methodology: A Reply. *Regional Science and Urban Economics.* Vol.36(300-308).

[11] Franzese, H. and J.Hays, (2005).Spatial Econometric Modeling, with Application to Employment Spillovers and Active-Labour-Market Policies in the European Union. Conference Paper at Workshop on 'Partisan Politics,Political Autonomy and Political Harmonization across Europe,Groningen University.

[12] Getis,A. and J.Aldstadt, (2004).Constructing the Spatial Weights Matrix Using a Local Statistic. *Geographical Analysis.* Vol.36, (2).

[13] Glaeser,E.,(2004). Cities,Information and Economic Growth. *Cityscape.* Vol.1, (1).

[14] Glaeser, E., J.Scheinkman and A.Shleifer, (1995). Economic Growth in A Cross-Section of Cities. *Journal of Monetary Economics.* Vol.36 (117-143).

[15] Jacobs,J.,(1961).*The Economy of Cities.* New York:Vintage Books.

[16] LeSage,J.P.,(1998). Spatial Econometrics. The Web Book of Regional Science , West Virginia University. Retrieved from http://www.rri.wvu.edu/WebBook/LeSage/etoolbox/index.html

[17] Lopez-Bazo,E.,T.del Barrio, M. Artis, (2002).The Regional Distribution of Spanish Unemployment: A Spatial Analysis.*Papers in Regional Science.* Vol.81 (365-389).

[18] Lucas, R.,(1988).On the Mechanics of Economic Development. *Journal of Monetary Economics.* 22(3-42).

[19] Lundberg,J.(2006).Using Spatial Econometrics to Analyse Local Growth in Sweeden. *Regional Studies.*Vol.40.3 (303-316).

[20] Marlet,G. and C.van Woerkens.(2004).Skills and Creativity in a Cross-section of Dutch Cities. *Tjalling C. Koopmans Research Institute.* Discussion Paper Series 04-29.

[21] Pei,L.(2007).Metropolitan Economic Growth and Spatial Dependence: Evidence from a Panel of China.*The 14th International Conference on Panel Data.*

[22] Rivera-Batiz,F.L. (1998).Productivity Gains From Geographic Concentration of Human Capital:Evidence From The Cities.*Journal of Urban Economics, 34*.380-400

[23] Romer,P.(1986).Increasing Returns and Long Run Growth. *Journal of Political Economy.* Vol.94 (1002-1037).

[24] Simon, C.J., (1998). Human Capital and Metropolitan Employment Growth. *Journal of Urban Economics .* Vol.43(223-243).

[25] Simon, C.J. and C.Nardinelli, (2002). Human Capital and The Rise of American Cities, 1900-1990 *Regional Science and Urban Economics* Vol.32(59-96).

[26] Sinnott, R.W.,(1984). Virtues of the Haversine.*Sky and Telescope,* Vol.68 (2), p.159.

[27] Taymaz, E. and Ozler, S.,(2005). Labor Market Policies and EU Accession: Problems and Prospects for Turkey.*Turkey: Economic Reform & Accession to the European Union,* pp.223-260.

[28] World Bank, 2006. *Turkey Labour Market Study,* PREM Unit Europe and Central Asia.

Chapter 6

TABLES

Table 6.1:

Summary statistics: means and standard deviations

City Variables

	Mean	**Std. Dev.**	**Min.**	**Max.**
Emp. growth 1990-2000 (%)	2.17	42.46	-79.62	492.57
Labor force growth 1990-2000 (%)	11.17	40.84	-75.35	336.43
1990 Starting Variables				
Employment level	10,501	28,458	148	433,943
Working age population	23,516	61,607	480	874,641
% with college degree	4.05	2.10	0.20	20.51
% with high school degree	12.41	4.82	0.81	38.57
% workers in manufacturing	13.18	10.65	0.17	70.24
Distance to central province (km)	60.46	43.19	0	223

Table 6.2:

Diagnostic tests for spatial dependence in OLS regression

Fitted model:		
empgr = hk + lnwa + dist + sman + d2 + d3 + d4 + d5 + d6 + d7 + d8 + d9 + d10 + d11 + d12		
Diagnostics:		
Test	Statistic	p-value
Moran's I	2.85	0.004
Spatial error:		
Lagrange multiplier	3.17	0.075
Robust Lagrange multiplier	0.45	0.503
Spatial lag:		
Lagrange multiplier	7.35	0.007
Robust Lagrange multiplier	4.63	0.031

Table 6.3:

Maximum likelihood estimates:

Spatial lag model

Dependent variable: District employment growth	
constant	-0.5321
	(0.1422)***
hk	0.9623
	(0.1960)***
lnwa	0.0238
	(0.0115)**
dist	-0.0009
	(0.0003)***
sman	0.4051
	(0.1297)***
rho	0.4828
	(0.1271)***
Observation	894
Log likelihood	-283.30
Wald test of rho=0: ($\chi^2(1)$)	14.43
Likelihood ratio test of rho=0: ($\chi^2(1)$)	13.91
* significant at 10%, ** significant at 5%, *** significant at 1%	