

Measuring the Spatial Correlation of Unemployment in Iraq-2007

Faisal G. Khamis

AL-Zaytoonah University of Jordan, Faculty of Economics and Administrative Sciences

PO box 130, Amman 11733, Jordan

Tel: 962-7-9594-7494 E-mail: faisal_alshamari@yahoo.com

Received: August 19, 2011

Accepted: October 12, 2011

Published: January 1, 2012

doi:10.5539/mas.v6n1p17

URL: <http://dx.doi.org/10.5539/mas.v6n1p17>

Abstract

Although many studies examined the existence of spatial pattern of unemployment in some developing and many developed countries in improving the prosperity or social status and reducing the inequalities in unemployment between areas of such country, there is still much work to be done. Some of these studies were found spatial pattern for unemployment using different statistical techniques and geographical mapping. Question is raised whether the spatial pattern of unemployment is existed in Iraq? The objective is to investigate the spatial structure of unemployment rate (UR) across different governorates to provide implications for policy makers, investigating the hot spots of UR, and showing visual picture for UR. The study utilized a cross-sectional census data for 18 governorates collected in 2007. Mapping was used as a first step to conduct visual inspection for UR using quartiles. Two statistics of spatial autocorrelation, based on sharing boundary neighbours, known as global and local Moran's I , were carried out for examining the global clustering and local clusters respectively. Based on visual inspection of mapping, the global clustering was found in UR and it was confirmed by the significant statistic found by global Moran's I . Out of 18, seven governorates: 3, 4, 5, 12, 15, 16, and 17 were found as local clusters in UR based on local Moran's I_i . In conclusion, the UR was found to vary across different governorates with black spots in northern and southern parts of the country.

Keywords: Spatial autocorrelation, Unemployment, Mapping, Moran statistic, Iraqgovernorates, Neighbours

1. Introduction

Unemployment is one of the main socioeconomic issues, which negatively affects both economic activity and social life. In recent years, there has been a growing interest in examining the existence of spatial autocorrelation of UR and its spatial relationship to many indicators such as poverty, education, etc. High unemployment, poverty, and weak social protection systems dominate public concerns and threaten fragile democracy (Poortman, et al., 2006).

It is well known in the literature that UR tends to vary systematically between regions. Partridge and Rickman (1997) found significant levels of dispersion in U.S. state UR in 1970s and 1990s. Evans and McCormick (1994) studied changes in the regional pattern of unemployment in UK since the 1970s. Utilizing results from OECD studies, they begin their analysis with the observation that regional unemployment differentials have been strikingly persistent for a very long period, both in UK and in other OECD countries. Evidence provided by Eichengreen (1993) indicated that the responsiveness of unemployment differentials was much greater in US than in Europe. Bertola (1999), as well as Balu and Kahn (1999), analyzed the impact of different institutions and regulations on labour market outcomes. According to their results, wage adjustment and labour mobility were affected by minimum-wage provisions unemployment benefits and welfare payments. However, the results of Layard (1997) implied that strict labour market regulations, employment protection and minimum wages not be the main target areas of policies aiming at a significant decline of unemployment. Instead they advised reform of social security systems combined with active labour market policies. In US, URs remain near a 25-year high and global unemployment is rising (Roelfs, et al., 2011). Unemployment can affect both psychological (Ezzy, 1993) and physiological (Arnetz, et al., 1991) risk factors for ill health. These effects may be mediated by various factors, such as changes in social support (Kong, Perrucci, & Perrucci, 1993) and altered alcohol and tobacco consumption (Janlert, 1997). Downward social class mobility and financial hardship may also affect health negatively and partly explain some of the increased mortality among individuals who are not employed (Whelan, 1992). Unemployment may interfere with one's social relationships, and increase the risk of divorce (Lester, 1996) which may in turn influence the risk of mortality (Lester, 2001). Elhorst (2003) provided a review

of the unemployment disparities literature. Blanchard and Katz (1992) discussed mechanisms which can operate to close such disparities. The three primary mechanisms were wage adjustments, outmigration of unemployed workers, and the movement of firms into low-wage/ high-unemployment areas.

In Iraq unemployment remains at very high levels, where the most population groups affected by unemployment were women and youth (Agency for technical cooperation and development, 2010). Epilepsy is a chronic illness that affects all ages in Iraq, specifically in Salahuddin governorate, which has long-term complications such as impairment of employability as stated by AL-Saad, et al. (2001). Unemployment in this governorate was found 33% and this rate was significantly greater among those stricken by epilepsy especially the young. Youth unemployment was high and increasing: 57% of those aged between 15 and 29 are unemployed and 450000 new young men are entering the labour market each year (UNIAU Iraq labour force analysis 2003-2008). About one in every ten Iraqis was living in absolute poverty according to best available estimates and another one in every seven or eight is at risk of falling into absolute poverty. Those most vulnerable include the unemployed, who make up about 30% of the labour force and more than 50% of urban youths, and others (legions of demobilized soldiers and ex-militia, war victims, the refugees, displaced persons and returnees). The labor force participation rate among Iraqi youth was estimated at less than 30%, while for the economy as a whole it is over 40% (Ministry of Planning and Development Cooperation/UNDP, 2005). Unemployment early in working life has been shown to increase the probability of future joblessness and lower future wages and can lead to alienation and social unrest (ILO, 1998–99). While reconstruction and associated public-sector jobs are important in the initial phase of Iraq's recovery, they will not create a sufficient number of jobs to meet the population's needs in the long term, even if recovery is on a massive scale (World Bank, 2006). Employed young men are less likely to participate in political violence, implying a positive correlation between unemployment and violence in locations with active insurgencies (Eli, et al., 2011). Eli et al. tested that prediction in Afghanistan, Iraq, and Philippines, where they didn't find significant relationship between unemployment and the rate of insurgent attacks that kill civilians.

A common feature of most of the above mentioned studies is that they investigated the functioning of labour market adjustments and the effects of labour market regulations without considering the spatial dimension of area labour market disparities. Most of these studies have shown that unemployed persons have an increased risk of death. Some studies investigated the wage curve taking spatial effects into account. Manning (1994) and Buettner (1999) analyzed the relationship between earnings and unemployment for British countries and German regions respectively. An analysis by Molho (1995) confirmed that there is significant spatial interaction among regional labour markets in UK. Overman and Puga (2002) analyzed unemployment clusters across European regions. The results of their nonparametric approach indicated that URs were much more homogeneous across neighbouring areas than across regions in the same EU country. The results found by Filiztekin (2007) indicated that the provincial URs were quite persistent and the gap across different regions widens further with spatial clusters emerging across Turkey. Lopez-Bazo, Barrio, and Artis (2001) discussed the role of neighbouring effects in explaining the spatial distribution of unemployment, where their results pointed to the emergence of at least two clusters in the regional distribution of UR in Spain. Massimo and Fabio (2011) examined and measured the efficiency of Italian policies for labour market carried out in the last 10 years, in terms of reduction in the regional disparities in comparison with the whole European distribution of unemployment. Massimo and Fabio showed that Italy has still a prominent role in the geographical disparities among regions and that its contribution to the geographical concentration of unemployment is still high.

To understand the linkages between socioeconomic variables, investigation should focus on features of the areas rather than on the compositional characteristics of residents of the area, which cannot fully describe the social environment in which people live (Macintyre, Maciver, & Sooman, 1993). So, spatial autocorrelation and geographical pattern of URs were studied by the author. Spatial autocorrelation is the term used for the interdependence of the values of a variable over space. However, it was argued that lattice data are spatially correlated, where exploratory spatial data analysis (ESDA) was used using lattice data. The ESDA quantifies the spatial pattern in order to increase the analyst's knowledge of the spatial system. As well as mapping plays an important role in the monitoring of unemployed people. Maps can reveal spatial patterns not previously recognized or suspected from the examination of a table of statistics and reveal high risk communities or problem areas (Lawson & Williams, 2001). The purpose of spatial analysis is to identify pattern in geographic data and attempt to explain this pattern. Findings are expected to enhance unemployment monitoring and policing interventions across governorates in Iraq.

Low wage flexibility and limited labour mobility involve persistent unemployment differentials across governorates in Iraq. The present paper focuses on the spatial structure of unemployment disparities across

governorates. Governorates are tightly linked by migration, commuting, and inter-governorate trade. These types of spatial interaction are exposed to the frictional effects of distance, possibly causing the spatial dependence of governorate labour market conditions. Governorates marked by high or low unemployment tend to cluster in space.

Reducing unemployment inequalities was not primary objective but emergent prosperity. The importance of the goal or the purpose of the present paper was followed from such argument stated that unemployment is a standard indicator for poverty status of the population. Cattaneo (2006) stated that a strong link existed between poverty and unemployment, being the lack of employment one of the main determinants of poverty. According to the study in Jordan by Amerah (1993), health was affected negatively by unemployment, where Amerah stated that since the mid-1980s unemployment had become a serious problem in Jordan, manifesting a widening gap between the demand for and supply of labour. Elhorst (2003) proposed several reasons that make studying the spatially uneven distribution of unemployment worthwhile. One of these reasons is the wide unemployment differentials imply inefficiency in the economy as a whole and reduces growth. Yip and Caine (2011) examined the complex relationships between suicide rates and regional unemployment rates during 2000-6 in Hong Kong, where they found strong correlation (0.86). Furthermore, to author's knowledge no studies used the spatial analysis techniques and geographical mapping in studying the inequalities in unemployment gradient in Iraq. Furthermore, the studies that used other advanced statistical techniques, such as structural equations modeling, in examining the inequalities of unemployment were very limited in Iraq.

The importance of mapping was stated by Koch (2005): Why make the map if detailed statistical tables carry the same results? Perhaps the most important reason for studying spatial statistics is not only interested in answering the "how much" question, but the "how much is where" question (Schabenberger&Gotway, 2005). In light of these: (1) the existence of spatial global clustering, (2) spatial local clusters of governorates with respect to UR were investigated, and (3) mapping was applied for transformed UR and for its local Moran's I_i values. This study contributes to the literature by examining the geographical distribution of UR, spatial global clustering and local clusters of unemployment. The study design was a cross-section analysis in a census survey conducted in Iraq in 2007. In conclusion, no spatial global clustering in UR was found, but local clusters were found. The major contribution was the demonstration that spatial locations have statistically significant effects on the likelihood and disparity of UR.

2. Materials and Methods

2.1 Data

The data were collected from the department of statistics, statistical yearbook, based on census conducted in Iraq in 2007. For each of ($N = 18$) governorate, UR was used. The UR is defined as the percentage of unemployed persons in the total economically active population (the total of unemployed and employed persons). An unemployed person is a person aged (15-65) year, who is without work, able to work, available for work, actively looking for work, and willing to accept the market wage.

2.2 Analysis

Data analysis involved five steps. In step 1, the UR was tested for normal distribution, where it was found not to follow normal distribution. Therefore, UR was transformed to follow normal distribution using LISREL software. The LISREL scales the normal scores so that the transformed variable has the same sample mean and standard deviation as the original variable. Thus, the normal score is a monotonic transformation of the original score with same mean and standard deviation (this characteristic can be considered as an advantage in this transformation) but with the values of skewness and kurtosis much reduced. In step 2, visual inspection based on the quantified gradients for transformed UR using quartiles was conducted. Step 3 included the calculation of global Moran's I for UR to detect the global clustering and also the significance of I -statistic using permutation test was examined. Step 4 involved the calculation of local Moran's I_i for the *ith* governorate and its p -value using Monte Carlo simulation to detect the local clusters of UR. In step 5, using quartiles, visual inspection for the gradients of local Moran values and their p -values were inspected based on choropleth mapping.

Based on global Moran's I , the geographical distribution of UR can be tested for whether it is random or not. Also, the author was interested in detecting and evaluating local clusters using local Moran's I_i statistic. In regional data analysis, governorates in close proximity to one another with similar values produce a spatial pattern indicative of positive spatial autocorrelation. The UR values were categorized into four intervals. These intervals were used for all maps using darker shades of gray to indicate increasing values of UR. Such approach enables qualitative evaluation of spatial pattern. In the neighbourhood researches, neighbours may be defined as governorates which border each other or within a certain distance of each other. In this research neighbouring

structure was defined as governorates which share a boundary. The *second order* method (queen pattern) which included both the first-order neighbours (rook pattern) and those diagonally linked (bishop pattern) was used. A neighbourhood system for Iraq's governorates was given in Figure 1, where the ID neighbours for each governorate were shown.

A choropleth map was used commonly to portray data collected for units, such as counties, districts, states or governorates. To construct a choropleth map, data for enumeration governorates were typically grouped into classes and a gray tone was assigned to each class. Although maps allow us to visually assess spatial pattern, they have two important limitations: their interpretation varies from person to person, and there is the possibility that a perceived pattern is actually the result of chance factors, and thus not meaningful. For these reasons, it makes sense to compute a numerical measure of spatial pattern, which can be accomplished using spatial autocorrelation.

2.2.1 Identification of Global Spatial Clustering

The goal of a global index of spatial autocorrelation is to summarize the degree to which similar observations tend to occur near to each other in geographic space. In this exploratory spatial analysis, the spatial autocorrelation using standard normal deviate (z-value) of Moran's I under normal assumption was tested. Moran's I is a coefficient used to measure the strength of spatial autocorrelation in regional data and provides also a test for unemployment clustering. Global clustering test was used to determine whether clustering was existed throughout the study area, without determining statistical significance of local clusters. The autocorrelation coefficient can be used to test the null hypothesis of no spatial autocorrelation or spatially independent versus the alternative of positive spatial autocorrelation:

H_0 : No clustering exists (no spatial autocorrelation)

H_1 : Clustering exists (positive spatial autocorrelation)

It is calculated as follows (Cliff & Ord, 1981):

$$I = \frac{N \sum_{i=1}^N \sum_{j=1}^N w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{S_0 \sum_{i=1}^N (x_i - \bar{x})^2} \text{ and } S_0 = \sum_{i=1}^N \sum_{j=1}^N w_{ij}, i \neq j$$

where, $N = 18$ was the number of governorates, the $w_{ij} = 1$ was a weight denoting the strength of the connection between two governorates i and j that shared a boundary, otherwise, $w_{ij} = \text{zero}$, x_i and x_j represents the UR in i th and j th governorate respectively.

A significant positive value of Moran's I indicates positive spatial autocorrelation, showing the overall pattern for the governorates having a high/low level of unemployment similar to their neighbouring governorates. A significant negative value for Moran's I indicates negative spatial autocorrelation, showing the governorates having a high/low level of unemployment unlike neighbouring governorates. To test the significance of global Moran's I , z -statistic which follows a standard normal distribution was applied. It was calculated as follows (Weeks, 1992):

$$z = \frac{I - E(I)}{\sqrt{\text{var}(I)}}$$

Permutation test was used. A permutation test tells us that a certain pattern in data was or was not likely to have arisen by chance. The observations of UR were randomly reallocated 1000 times with 1000 of spatial autocorrelations were calculated in each time to test the null hypothesis of randomness. The hypothesis under investigation suggests that there will be a tendency for a certain type of spatial pattern to appear in data, whereas the null hypothesis says that if this pattern was present then this was a pure chance effect of observations in a random order.

The analysis suggested an evidence of clustering if the result of the global test was significant but it doesn't identify the locations of any particular clusters. Beside, clustering which represent global characteristic of unemployment, the existence and location of localized spatial unemployment clusters in the study population are of interest in geographic sociology. Accordingly, local spatial statistic was advocated for identifying and assessing potential hot spots or clusters.

2.2.2 Identification of Local Spatial Clusters

A global index can suggest *clustering* but cannot identify individual *clusters* (Waller & Gotway, 2004). Local Indicators of Spatial Associations (LISAs) measure the degree of spatial dependence to allow for the effects of neighbourhood based on each governorate associated value of UR. The main purpose of such index is to provide a local measure of similarity between each governorate's associated value and those of nearby or surrounded governorates. Anselin (1995) proposed the local Moran's I_i statistic to test the local autocorrelation, where local spatial clusters, sometimes referred to as hot spots, may be identified as those locations or sets of contiguous locations for which the local Moran's I_i was significant. However, Moran's I_i for i th governorate may be defined as (Waller & Gotway, 2004):

$$I_i = \frac{(x_i - \bar{x})}{S} \sum_{j=1}^{N_i} \left(w_{ij} / \sum_{j=1}^{N_i} w_{ij} \right) \frac{(x_j - \bar{x})}{S}, \quad i = 1, 2, \dots, 18$$

where, analogous to the global Moran's I , the x_i and x_j represents the UR in i th and j th governorate respectively, N_i = number of neighbours for i th governorate, and S is the standard deviation of UR. It was noteworthy that the number of neighbours for i th governorate were taken into account by the

amount: $\left(w_{ij} / \sum_{j=1}^{N_i} w_{ij} \right)$, where w_{ij} was measured in the same manner as in Moran's I statistic. Local Moran

statistic was used to test the null hypothesis of *no clusters*.

The typical output of a LISA analysis involves the values of the LISAs themselves, which were typically mapped to indicate areas with high values, suggesting stronger local autocorrelation than others. LISA values may be due to aggregations of high values, aggregations of low values, or aggregations of moderate values. Thereby, high values of I_i suggested clusters of similar (but not necessarily large) values across several governorates, and low value of I_i suggested an outlying cluster in a single governorate i (being different from most or all of its neighbours). A positive local Moran value indicates local stability, such as governorate that has high/low UR surrounded by governorate that has high/low UR. A negative local Moran value indicates local instability, such as governorate has low unemployment surrounded by governorate has high unemployment or vice versa. However, each governorate's I_i value can be mapped to provide insight into the location of governorates with comparatively high or low local association with their neighbouring values. In the statistical analysis, all programs performed in S+8 Software.

3. Results

Descriptive statistics were calculated for transformed UR, where the mean and standard deviation were found 11.71 and 4.83 respectively; skewness and kurtosis were found 0.00 and -0.10 respectively. The five-number summary of UR data set consisted of the minimum, maximum and quartiles written in increasing order: Min=2.14, Q_1 =8.29, Q_2 =11.71, Q_3 =15.14 and Max=21.28. From the five-number summary, the variations of the four quarters of the UR data were found 6.15, 9.57, 3.43 and 6.68 respectively, where the second quarter has the greatest variation of all. Thiqr governorate accounted for the highest rate of unemployment 20.90%. It was followed by the governorates of Diala and Missan, as accounted for 20.4% and 19.60%, respectively. The lowest rate was found in the governorate of Suleimaniya with (2.14%). This can be explained by the persistent growth of economic activity in most fields, which provide more job opportunities, especially for those who have academic qualifications. However, the UR in Iraq decreased dramatically from 28.10% in 2003 to 11.71% in 2007. Figure 1 shows the study area explaining all governorates with their identification numbers (ID).

Figure 2a and b shows visual insight for transformed UR and its local Moran values respectively, with darkest shade corresponding to the highest quartile. Based on visual inspection, an overall worsening pattern (higher scores) was found in the western-northern and southern parts of the country. These maps displayed geographical inequalities across governorates of Iraq. The suggestion of spatial clustering of similar values that follows from a visual inspection of mapping was confirmed by a positive significant global Moran's I of 0.23 with an associated standard normal z -value of 2.25 and $p = .024$. To investigate global clustering, permutation test was done, where the permutation $p = .018$ was found significant. Thus, the null hypothesis of no spatial autocorrelation was rejected. Seven significant clusters were found, where their ID were: 3, 4, 5, 12, 15, 16, and 17 to have higher level in UR compared to other governorates as shown from their local Moran values and their p -values in Table 1, where the significance values were shown in boldface.

Simulated data are useful for validating the results of spatial analysis. However, using Monte Carlo simulation, 9999 random samples, where eighteen values for each sample, were simulated. The process of simulation was conducted under standard normal distribution to calculate the p -values for local Moran values of UR. When the word simulation is used, it is referred to an analytical method meant to imitate a real-life system, especially when other analyses are too mathematically complex or too difficult to reproduce. While results were specific to these data, the case study helps identify general concepts for future study.

4. Discussion

This study, undertaken in Iraq, quantified the spatial autocorrelation of UR. Spatial global clustering and local clusters for UR were examined based on global Moran's I and local Moran's I_i respectively. Such findings allow policy makers to better identify what types of resources are needed and precisely where they should be employed. The above framework is proposed to analyze the spatial pattern of UR and revealed some noteworthy findings. After rejecting the null hypothesis, it becomes possible to conclude that there was a form of global clustering and it was of course of interest to know the exact nature of this clustering process. Are there hot-spot clusters? If so, how many hot-spots are there and where are they located?

Exploratory tools were used such as descriptive table and somewhat small area choropleth maps. Maps provide a powerful means to communicate data to others. Unlike information displayed in graphs, tables and charts, maps also provide bookmarks for memories. In this way, maps were not passive mechanism for presenting information. Usually, in the spatial analysis and geographical mapping, small spatial areas should be used such as districts, counties, etc. But in this research governorates were used which considered somewhat larger than for example the districts because the data were not available for smaller areas. Most often the word 'neighbourhood' suggested a relatively small area surrounding individuals' homes but researchers commonly make use of larger spatial area such as census tracts (Coulton, et al., 2001). However, it was noteworthy that Iraq is relatively small country in area and in population, so the governorates can be considered as small spatial areas. Often, choices about neighbourhood spatial definitions were made with respect to convenience and availability of contextual data rather than study purpose (Schaefer-McDaniel, et al., 2009). Schaefer-McDaniel et al. stated that, researchers might utilize census data and thus rely on census-imposed boundaries to define neighbourhoods even though, these spatial areas may not be the best geographic units for the study topic.

Significant spatial interaction between neighbouring UR implied that cross-section data was marked by a positive spatial autocorrelation. In this case, similar values, either high or low, were more spatially clustered than could be caused by chance. In contrast to the clearly defined autocorrelation in time-series, the dependence is multidirectional in the spatial case. Local values that are very different from the mean or median would indicate locations that contribute more than their expected share to the global statistic. These may be outliers or high leverage points and thus would invite closer scouting.

As noted by Waller and Jacques (1995) that the test for spatial pattern employs alternative hypotheses of two types; the omnibus not the null hypothesis or more specific alternatives. Tests with specific alternatives include focused tests that are sensitive to monotonically decreasing risk as distance from a putative exposure source (the focus) increases. Acceptance of either types (the omnibus or a more specific alternatives) only demonstrates that some spatial pattern exist, and does not implicate a cause (Jacques, 2004). Hence the existence of a spatial pattern alone cannot demonstrate nor prove a causal mechanism. However, the existence of unemployment clusters, i.e. similar labour market conditions in neighbouring governorates suggests that policies that promote labour mobility across longer distances might be appropriate to reducing differences in unemployment.

Iraq faced specific challenges with regard to jobs in its state-owned enterprises. With over 500000 workers on the payroll, state-owned enterprises are a major source of employment. Yet, appraisals undertaken in 2004 suggested that many of these enterprises are grossly overstaffed (DFID, 2004). Analysis of other episodes of conflict in Iraq indicated a very strong reciprocal relationship between the lack of security and high unemployment (World Bank, 1998 and 2003). While reconstruction and associated public-sector jobs are important in the initial phase of Iraq's recovery, they will not create a sufficient number of jobs to meet the population's needs in the long term, even if recovery is on a massive scale. We recommend designing global development strategies that focus on job creation and income generation and incorporate elements of basic social protection and social dialogue at the global level. Regional UR is highly correlated in space, since they change usually by small amounts and often in same directions simultaneously across space (Elhorst, 2000). As the spatial clusters of unemployment in Iraq were found, most probably there are several variables that affect the unemployment. For example, the Iraqi population is relatively young, which is equivalent to saying that the birth

rate is relatively high, a result of which a governorate's population growth rate exceeds its employment growth rate. Also, the labour force participation rate and the migration rate were relatively high.

The application of statistical techniques to spatial data faces an important challenge, as expressed in the first law of geography: "everything is related to everything else, but closer things are more related than distant things" (Tobler, 1979). The quantitative expression of this principal was the effect of *spatial dependence*, i.e. when the observed values were spatially clustered, the samples were not independent. Employment growth in governorate i generates employment growth in governorate j . This mechanism of transmission causes a spatial autocorrelation of employment growth. The obvious question after finding significant clusters of UR was-why? Could this pattern associated by the spatial pattern of socioeconomic indicators such as the levels of education or by the limitation of economic resources? However, further research is required regarding this bivariate spatial association between UR and socioeconomic indicators which will be our interest in the near future. This paper adds to the global body of knowledge on the utilization of spatial analysis to strengthen the research-policy interface in the developing countries. Although, this work was conducted as part of a wider study, its immediate implications are more for policy makers and practitioners than for researchers.

It should be emphasized that unemployment problem cannot be overcome in the short-run but long-term efforts are needed to tackle the inequalities across governorates, and in turn, enabling the economy to create more job opportunities and to establish new projects especially in the governorates that found as hot spot clusters. It means that the place of the problem is now clearly shown. Also, efforts should be made to aware the public through the media and education system about the labour market requirements of various specializations and occupations in the coming years. This would assist students to specialize in the required occupations instead of increasing the number of unemployed in not needed occupations. Also, offering free training courses to the unemployed in the hot-spot clusters should be help to overcome the problem of unemployed. However, the author agree with the suggestions of Amerah (1993) about government policies to alleviate unemployment inequalities in the hot spot clusters, such as: activating the role of public health institutions and promoting the coordination among them, improving the public sector procedures with regard to the recruitment of qualified staff, and establishing a national information scheme to include data and information related the various aspects of Iraqi labour market. Finally, unemployment studies should be conducted periodically in light of the changing socioeconomic and political conditions.

5. Conclusions

Global clustering and local clusters for UR were studied. The results were conclusive in at least four aspects. First, visual inspection showed that high levels of UR was concentrated in the central, and southern parts of the country, for instance in the governorates 2, 6, 15 and 16. Second, several governorates such as 3, 4, and 5 were not observed visually as hot spots, but after considering the information of their neighbours, i.e., calculating their local Moran's I_i values, the patterns of their hot spots can be obviously seen. Third, global clustering was found for UR, and many governorates were found to be local clusters in the ester-northern and southern parts: 3, 4, 5, 12, 15, 16, and 17. The opposite being the case for those with low unemployment was seen in the central part. Forth, from negative local Moran values, looking at the local variation, some of governorates represented as areas of dissimilarity, for example, governorates 2 and 6; means that governorate with low UR surrounded by governorates with high UR or vice versa. Massive layoffs in a certain governorate will tend to depress adjacent labour markets as well. Likewise, every measure that reduces local unemployment will also have positive effects in neighbouring labour markets. This calls for close cooperation and common measures between governorates in order to diminish labour market problems.

The analytical approach used here accurately delineates governorates of relatively high UR, and permits policy makers to develop strategies to minimize the UR inequalities between governorates. Policy which pays attention to area characteristics will reduce UR inequalities and consequently improve the prosperity which in turn will improve the health status. In summary, the study supports the hypothesis of a spatial inequality in UR at area level that probably reflects the governorate distribution of education level. Further research is required to study the spatial pattern of education variable and the distribution of job chances offered by the country and their bivariate spatial association with spatial pattern of UR in attempting to interpret the spatial clusters.

References

- AL-Saad, S. K., AL-Khayat, J. Q., & AL-Nooman, N. N. (2011). Frequency of unemployment among epileptic in Tikrit, Iraq. *Eastern Mediterranean Health Journal*, 7(3), 531-535.
- Amerah, M. (1993). Unemployment in Jordan: dimensions and prospects. Center for international studies, pp.1-56, http://library.fes.de/pdf-files/bueros/vifa-nahost/b93_00075.pdf

- Anselin, L. (1995). Local Indicators of Spatial Association-LISA. *Geographical Analysis*, 27(2), 93-115. <http://dx.doi.org/10.1111/j.1538-4632.1995.tb00338.x>
- Battaglia, M., & Iraldo, F. (2011). Spatial Effects of Labour Policies Promoted in Italy from 1996 to 2006: An Analysis in the EU Context. *European Planning Studies*, 19(2), 311-330. <http://dx.doi.org/10.1080/09654313.2011.532678>
- Bertola, G. (1999). Microeconomic Perspectives on Aggregate Labour Markets. In: Ashenfelter, O (Ed.), *Handbook of Labour Economics*. Elsevier: Amsterdam, pp.2985-3028.
- Blanchard, O. J., & Katz, L. F. (1992). Regional evolutions. *Brookings Papers on Economic Activity*, 1(Macroeconomics), 1-75.
- Blau, F. D., & Kahn, L. M. (1999). Institutions and Laws in the Labour market. In: Ashenfelter, O (Ed.), *Handbook of Labour Economics*. Elsevier: Amsterdam, pp.1399-1461.
- Buettner, T. (1999). The effect of unemployment, aggregate wages and spatial contiguity on local wages: An investigation with German District level data. *Papers in Regional Sciences*, 78(1), 47-67. <http://dx.doi.org/10.1111/j.1435-5597.1999.tb00730.x>
- Cattaneo, C. (2006). The determinants of actual migration and the role of wages and unemployment in Albania: an empirical analysis. Liuc papers, No. 196, Serie Economia e Impresa, pp.1-35. <http://www.biblio.liuc.it/liucpap/pdf/196.pdf>
- Cliff, A. D., & Ord, J. K. (1981). *Spatial processes: Models & Applications*. London: Page Bros.
- Coulton, C. J., Korbin, J., Chan, T., & Su, M. (2001). Mapping residents' perceptions of neighbourhood boundaries: A methodological note. *American journal of community psychology*, 29(2), 371-383. <http://dx.doi.org/10.1023/A:1010303419034>
- Cressie, N. A. C. (1993). *Statistics for spatial data*. (Revised Ed). New York: Wiley & sons.
- DFID (U.K. Department for International Development). (2004). *Iraq's SOE Feasibility Studies*. Mimeo, London.
- Eichengreen, B. (1993). Labour markets and European monetary unification, in: Masson PR, Taylor MP (eds.), *Policy Issues in the Operation of Currency Unions*, Cambridge University Press.
- Elhorst, J. P. (2000). The mystery of regional unemployment differentials; a survey of theoretical and empirical explanations, pp.1-56. <http://som.eldoc.ub.rug.nl/FILES/reports/themeC/2000/00C06/00C06.pdf>
- Elhorst, J. P. (2003). The mystery of regional unemployment differentials: Theoretical and empirical explanations. *Journal of Economic Survey*, 17(5), 709-748. <http://dx.doi.org/10.1046/j.1467-6419.2003.00211.x>
- Eli, B., Michael, C., Joseph, F. H., & Jacob, S. N. (2011). Do working men rebel? Insurgency and unemployment in Afghanistan, Iraq, and the Philippines. *Journal of Conflict Resolution*, 55(4), 496-528. <http://dx.doi.org/10.1177/0022002710393920>
- Evans, P., & McCormick, B. (1994). The new pattern of regional unemployment: Causes and policy significance. *The Economic Journal*, 104(424), 633-647.
- Filiztekin, A. (2007). Regional unemployment in Turkey, pp.1-31. <http://www.ecomod.org/files/papers/486.pdf>
- Haining, R. (2003). *Spatial Data Analysis: Theory and Practice*. Cambridge: Cambridge university press. <http://dx.doi.org/10.1017/CBO9780511754944>
- Hooghe, M., Vanhoutte, B., Hardyns, W., & Bircan, T. (2011). Unemployment, Inequality, Poverty and Crime: Spatial Distribution Patterns of Criminal Acts in Belgium, 2001-06. *British Journal of Criminology*, 51(1), 1-20. <http://dx.doi.org/10.1093/bjc/azq067>
- ILO (International Labor Organization). (1998-99). *World Employment Report*. Geneva. http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/dwcms_080628.pdf
- Jacques, G. M. (2004). Current practices in the spatial analysis of cancer: flies in the ointment. *International journal of health geographics*, 3(22), 1-10. <http://www.ij-healthgeographics.com/content/3/1/22>
- Koch, T. (2005). *Cartographies of disease: maps, mapping, and medicine*. (1st. Ed). California: Guilford Press.
- Lawson, A. B., & Williams, F. R. (2001). An introductory guide to disease mapping. *Wiley & Sons*, New York. <http://dx.doi.org/10.1002/0470842571>

- Layered, R. (1997). *Preventing long-term unemployment: an economic analysis (with discussion)*. In: Snower D. J., Dehesa G. de la (eds.). *Unemployment policy*. Cambridge University Press, Cambridge. <http://dx.doi.org/10.1017/CBO9780511752025.025>
- Lopez-Bazo, E., Barrio, T., & Artis, M. (2000). The geographical distribution of unemployment, pp.1-40. <http://www.eco.ub.es/~elopez/geounemp.pdf>
- Macintyre, S., Maciver, S., & Sooman, A. (1993). Area, class, and health: Should we be focusing on places or people? *Journal of social policy*, 22(2), 213-234. <http://dx.doi.org/10.1017/S0047279400019310>
- Manning, N. D. (1994). Earning, unemployment and contiguity: evidence from British countries 1976-1992. *Scottish Journal of Political Economy*, 41(1), 43-68. <http://dx.doi.org/10.1111/j.1467-9485.1994.tb01109.x>
- Molho, I. (1995). Spatial autocorrelation in British unemployment. *Journal of Regional Sciences*, 35(4), 641-658. <http://dx.doi.org/10.1111/j.1467-9787.1995.tb01297.x>
- Overman, H. G., & Puga, D. (2002). *Unemployment clusters across Europe's regions and countries*. Economic policy. Oxford, Blackwell.
- Partridge, M. D., & Rickman, D. S. (1997). The dispersion of US state unemployment rates: The role of market and non-market equilibrium factors. *Regional Studies: The Journal of the Regional Studies Association*, 31(6), 593-606.
- Poortman, C. J., Saba, J. P., et al. (2006). Rebuilding Iraq: Economic reform and transition. *Document of the World Bank*, pp.1-126.
- Roelfs, D. J., Shor, E., Davidson, K. W., & Schwartz, J. E. (2011). Losing life and livelihood: A systematic review and meta-analysis of unemployment and all-cause mortality. *Social Science & Medicine*, in press. <http://dx.doi.org/10.1016/j.socscimed.2011.01.005>
- Schabenberger, O., & Gotway, C. A. (2005). *Statistical methods for spatial data analysis*. Boca Raton: Chapman & Hall.
- Schaefer-McDaniel, N., Caughy, M. O'B., O'Campo, P., & Gearey, W. (2009). Examining methodological details of neighbourhood observations and the relationship to health: A literature review. *Social science & medicine*, 1-16, (article in press). <http://dx.doi.org/10.1016/j.socscimed.2009.10.018>
- Tobler, W. R. (1979). *Cellular geography*, In: *Philosophy in Geography*. Holland: DReidel Publishing Company.
- Waller, L. A., & Gotway, C. A. (2004). *Applied Spatial Statistics for Public Health Data*. New Jersey: Wiley & Sons. <http://dx.doi.org/10.1002/0471662682>
- Waller, L. A., & Jacques, G. M. (1995). Disease models implicit in statistical tests of disease clustering. *Epidemiology*, 6, 584-590. <http://dx.doi.org/10.1097/00001648-199511000-00004>
- Weeks, J. R. (1992). *Population: An Introduction to concepts and Issues*. (5th. Ed). Wadsworth, Inc.
- World Bank. (2006). Rebuilding Iraq: Economic reform and transition. <http://siteresources.worldbank.org/IRFFI/Resources/IraqCEM-finalComplete.pdf>
- Yip, P. S. F., & Caine, E. D. (2011). Employment status and suicide: the complex relationships between changing unemployment rates and death rates. *Journal of Epidemiology & Community Health*, 65(8), 733-736. <http://dx.doi.org/10.1136/jech.2010.110726>

Table 1. Explains the UR, Local Moran’s I_i round it to two digits with its corresponding p -value round it to three digits

ID	Transformed UR	I_i for UR	p
1	10.02	.09	.344
2	15.80	-.65	.925
3	2.14	.95	.011
4	6.55	1.49	.004
5	5.12	.93	.007
6	18.31	-1.01	.975
7	9.30	.03	.342
8	12.04	-.01	.493
9	8.51	-.01	.480
10	13.05	-.08	.613
11	10.71	-.15	.717
12	7.62	.32	.058
13	11.38	.00	.462
14	14.13	.17	.181
15	14.91	.45	.076
16	21.28	.91	.006
17	16.87	.73	.046
18	13.05	.34	.135

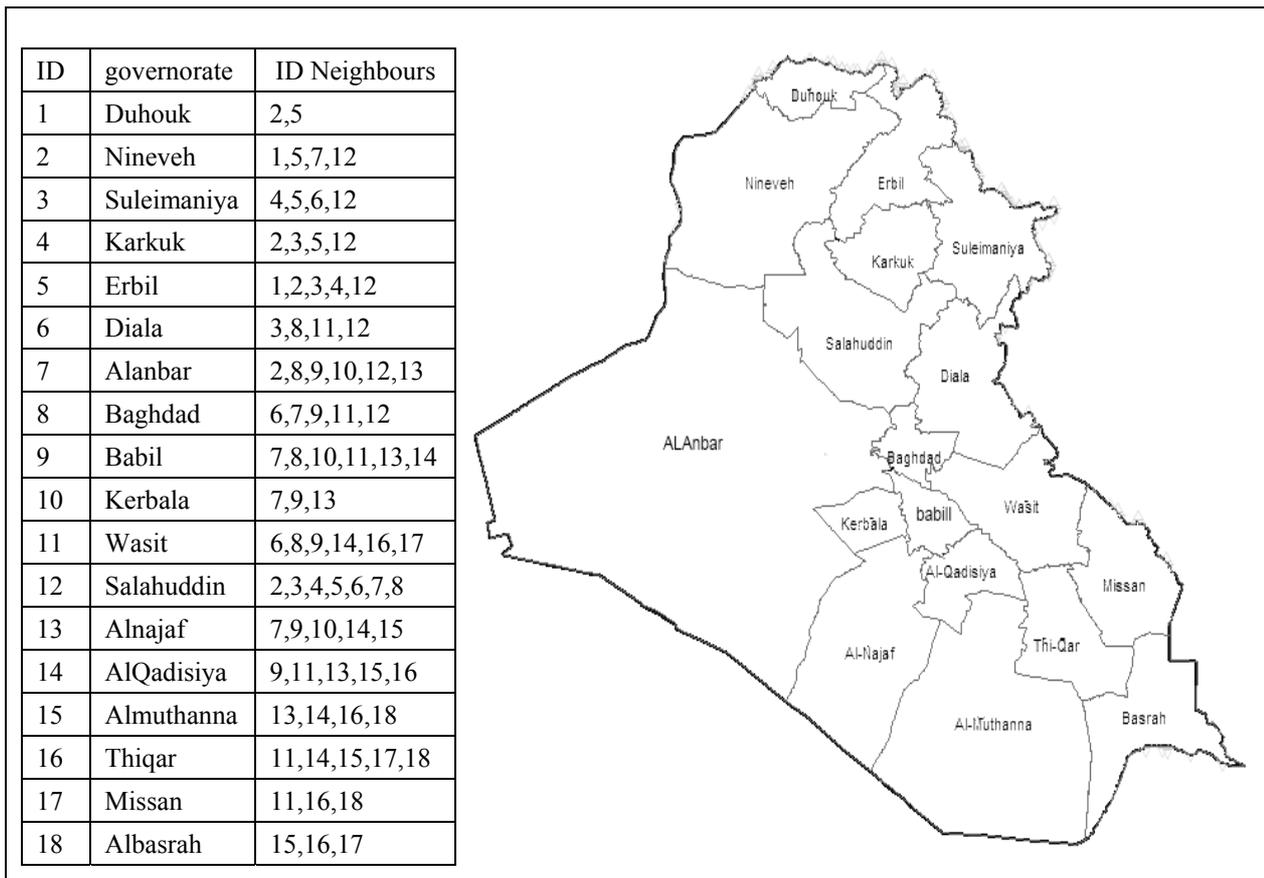


Figure 1. Study area shows all governorates with their ID and the neighbours of each governorate

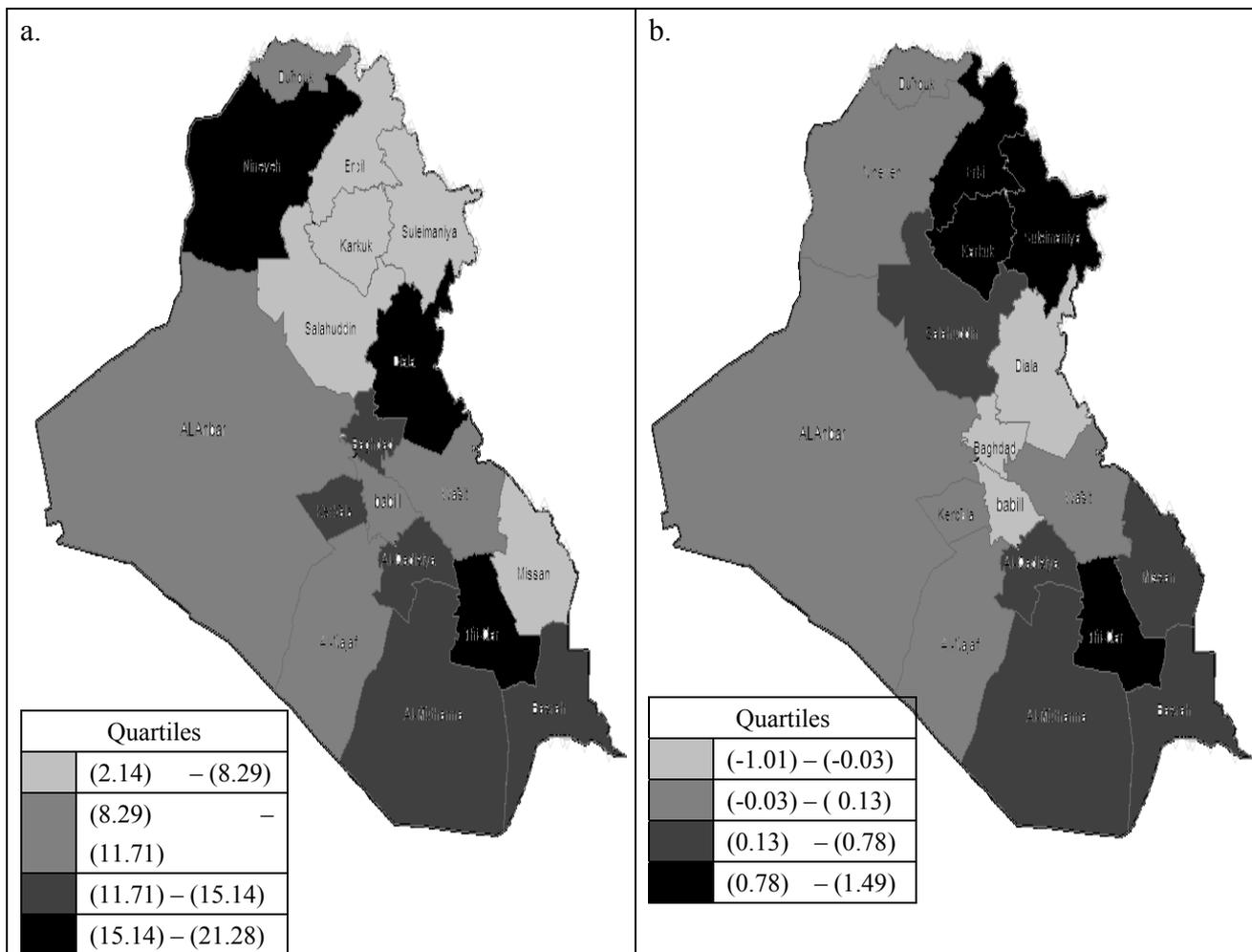


Figure 2. Choropleth maps show: a. transformed UR variable, b. local Moran values of transformed UR variable