REGINAL MISMATCH TENDENCIES IN ROMANIA-EVIDENCE FROM BEVERIDGE CURVE

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Biographical notes

Cristina Lincaru is a mechanical engineer, specialising in Fine mechanics. Optical and biomedical apparatus (1992) and a Doctor in Management since 9 December 2005 with the thesis: “Labour market in Romania. Organizing, working and directions to ameliorate its performances”, under the Prof. Univ. Dr. Gheorghe Raboaca’s coordination. She has been working as a scientific researcher at INCSMPS Romania since 1996. Her scientific career in the long term is aimed at the perspective of achieving excellence of expertise in the field of quality in employment in the knowledge society context for the transitional countries as a general objective. As specific objectives she intends to study how quality in employment is linked with some distinct domains such as: knowledge management, stimulation of innovation, increasing the long term competitiveness, sustainable development, wage developments, improving bargaining and social dialog, as well as identifying new opportunities to create more and better jobs.

Abstract

As a benefit of the recent data improvement regarding the data on job vacancies (by ISCO-88 groups and by CANE Rev.1 section) in Romania provides an opportunity for the examination on short term shifts (between 2005-2008) of the labour markets at NUTS 1 (4 Macroregions) and NUTS 2 (8 development regions) by using the Beveridge curve. In such literature it is noted that “the Beveridge curve depicts the empirical relationship between job vacancies and unemployment, which in turn reflects the underlying efficiency of the job matching process.” (Robert G. Valletta.) Such a regional mismatch can occur as a consequence of uneven regional employment growth or in other words when unemployment with job vacancies, coexists, including the localisation of paring of the unemployment rate and vacancies rate, there could be the beginning of a spatial analysis.

JEL classification: J60 – General, J61 - Geographic Labor Mobility, J64 Job Search
**Key words:** job vacancies, unemployment, matching on the labour market;

**Introduction**

The view of a national single labour market could be when enhanced considering it as a dynamic system described by the interactions of the regional/local labour markets. Part of these interactions is that between unemployment and vacancies described by Mortensen, Pissarides and Diamond into the search and matching theory.

The spatial dimension of the labour market offers the opportunity to bear in mind the Beveridge curve considering also the possible interactions among “functional compartments”. The matching function could be influenced by the spatial distribution of vacancies and unemployment. "Due to common or idiosyncratic (regional specific) shocks, regional labour markets are not unrelated. They are tied together due to their location, and spillovers might lead to spatial effects”

The empiric Beveridge Curve was explained using regional panel data analysis of the matching function. Relatively new development in the literature „take into account the effect of neighbouring regions’ unemployment on the hiring of a region in question” (Burda and Profit, 1996) and Burghess and Profit (2001) (could be identified spillover effects of regional unemployment on hiring’s).

At any one time there are vacancies as well as unemployment without any apparent relationship. Sometimes “when the job-matching process is slow, perhaps due to changes in the amount of necessary job reallocation across geographic regions or industries, both unemployment and vacancies can coexist at high levels, representing underutilized labour resources”

Using the Moran’s I (spatial statistic) tool I tried to measure the spatial autocorrelation based on “on both feature locations and feature values simultaneously” with a view to identifying if there is a pattern expressed as” clustered, dispersed or random” for the 2 variables from the Beveridge curve: the unemployment and vacancies with NUTS 2 and NUTS3 data.

Those 2 variables were linked with the locations from the map in Arc GIS 9.3. (ArcGIS Catalog and Arc MAP). With the Arc GIS software there was aggregated the NUTS 2 region’s map for Romania (the map for development regions) into NUTS 1 region’s map for Romania (the map

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2 Shigeki Kano and Maoto Ohta, Beveridge Curve and Regional Mobilities of Unemployed Job Seekers in Japan, Institute of Policy and Planning Sciences, Discussion Paper Series, No 1015, University of TSUKUBA, Tsukuba, Ibaraki 305-8573, Japan, December 2002; Pg.2
3 Rob Valletta, Jaclyn Hodges, Job Matching: Evidence from the Beveridge Curve, FRBSF ECONOMIC LETTER, Number 2006-08, April 21, 2006

33
for macroregions). Spatial econometrics\(^4\) through the GeoDa software\(^5\) has some applications like Bivariate Moran as a part of spatial Lag Construction. In the table 2 we calculate the bivariate Moran’s I in order to measure the level of correlation between the value of the variable x represented by the annual rate of the vacancies by NACE 1 and by occupation ISCO 88 at a specific location with the weighted average of the second variable the annual registered unemployment rate calculated as the average over the neighbouring locations (using the Rook Contiguity Weight matrix).

1. Theoretical issues regarding the Beveridge curve

The Beveridge curve describes the relationship between vacancies and unemployment in a visual manner – as a plot. The inverse relation between unemployment and vacancies in an economy was named first UV- or Beveridge-curve since the 1980s after William Beveridge. This curve has changed radically the economic thinking over previous decades. Dow and Dicks-Mireaux in 1958 saw it as a measure of excess demand.\(^6\)

“The Beveridge curve depicts the empirical negative relationship between job vacancy rate and unemployment rate, and reflects the efficiency of the job matching process.”\(^7\) The Beveridge curve could be described as the empirical relationship between:

a. the number of vacancies and the number of unemployment – using absolute indicators;

b. the unemployment and vacancies rates – using relative indicators.

If employment is seen as a successful event of exit from the unemployment and at the same time occupying a vacancy then Blanchard et al. (1989) and Pissarides (2000) proposed „The

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\(^4\) Attila Varga, Introduction to Applied Spatial Econometrics, course presentation, DIMETIC Pécs, July 3, 2009;

\(^5\) The GeoDa Center for Geospatial Analysis and Computation succeeds the Spatial Analysis Laboratory (SAL) which was founded by the new School of Geographical Sciences Director Luc Anselin while at the University of Illinois. http://geodacenter.asu.edu/about

\(^6\) Peter Rodenburg, The Remarkable Place of the UVCurve in Economic Theory, TI 2007-088/1, Tinbergen Institute Discussion Paper, University of Amsterdam, and Tinbergen Institute.

\(^7\) Florence Bouvet, The Beveridge Curve in Europe: New evidence using national and regional data, March 2009
The matching process is uncoordinated, costly and time-consuming trade in the labour market. It’s result is the forming of the pairing of unemployed workers with vacancies with the firms searching for employees. “The key idea of matching models is that the complicated and stochastic process of job search is captured in one single, well-behaved, aggregate, mathematical function, called the matching function. The idea of a labour market divided in frictionless submarkets is abandoned and replaced by one mathematical function accounting for the flows in the labour market.”

Matching could be expressed through a hiring rate.

Matching-function shows how many successful matches \( M \) of unemployed workers \( U \) and firms with vacancies \( V \) occur every period:

\[
M = M(U; V)^8
\]  

\( (1) \)

**Movement along the Beveridge curve / business cycle**

**A change in the quantity of demand**

**Increasing mismatch**

**Hysteresis effect**

The curve shifts / structural change (new equilibrium)

Outward (inward) shift in the curve / curve movement

**A change in the demand**

**Movement along the Beveridge curve** (see Figure 2) express into literature – a change in the quantity of demand, determined by cyclical factors (shocks):

a) movement along the Beveridge curve into the (a) direction: increasing the vacancies number, decreasing the unemployment (number of persons) represent the situation of the rising the economic activity, high demand (Dow and Dicks –Mireaux, 1958:4). This could be explained as “Given the matching process on the labour market, the higher the level of vacant jobs, the lower the level of unemployment, as the probability of finding a job increases.”

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9 Peter Rodenburg, The Remarkable Place of the UVCurve in Economic Theory, TI 2007-088/1, Tinbergen Institute Discussion Paper, University of Amsterdam, and Tinbergen Institute.

10 ***,Labour Market Mismatches in the Eeuro Area Countries, March 2002, European Central Bank, pg.14
b) movement along the Beveridge curve into the (b) direction: decreasing the vacancies, increasing the unemployment, weak economic activity, low demand case (economy is contracting - in periods of weak activity, vacancies are closed, and workers become unemployed.)

When the economy fluctuates with a “stationary Beveridge Curve, we expect to see the uv dots cycling anti-clockwise around a fixed downward sloping line. If the steadystate Beveridge Curve is also moving then these cycles will shift either rightwards or leftwards. Furthermore if the steady state curve is moving very fast, the cycles will not be clearly visible. By examining better the pictures, two points stand out. “\text{11}"

**Outward (inward) shift in the curve** / curve movement or the curve shifts represents the structural change (new equilibrium) determined by the change in the demand. “Four groups of factors could explain the observed shifts: composition of the unemployed population and the labour force, institutional factors affecting the matching efficiency between unemployed workers and job vacancies, business cycle, and other structural shocks such as productivity growth and reallocation of employment across sectors and regions”\text{12}. Also, “anything which makes it easier to match the unemployed to the available vacancies will shift the Beveridge Curve to the left and reduce equilibrium unemployment. Factors which operate in this way include the reduction of barriers to mobility which may be geographical or occupational.”\text{13}

Generally speaking, the movements along a fixed Beveridge curve have been associated with cyclical factors, while shifts in the Beveridge curve (i.e. higher or lower unemployment rate for a given vacancy rate) have been interpreted as reflecting structural changes which affect the matching between jobs and unemployed workers.

**Increasing mismatch**, reduction in the matching efficiency, deterioration of the labour market functioning / outward / inward movement of the Beveridge curve or the increasing frictions is presented in the figure 2 with blue arrow. “In general, the position of the Beveridge curve in the (u,v) space is related to the degree of frictions in the labour market. The closer the curve to the origin, the smaller are the frictions, and the more efficient is the matching technology.”\text{14} The matching theory argues that „the matching process is characterized by frictions. Frictions can be

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\text{11} Stephen Nickell, Luca Nunziata, Wolfgang Ochel, Glenda Quintini, The Beveridge Curve, Unemployment and Wages in the OECD from the 1960s to the 1990s, This paper was produced as part of the Centre’s Labour Markets Programme, Published by Centre for Economic Performance London School of Economics and Political Science, July 2002, pg.13.

\text{12} Florence Bouvet, The Beveridge Curve in Europe: New evidence using national and regional data, March 2009, pg.7

\text{13} Stephen Nickell, Luca Nunziata, Wolfgang Ochel, Glenda Quintini, The Beveridge Curve, Unemployment and Wages in the OECD from the 1960s to the 1990s, This paper was produced as part of the Centre’s Labour Markets Programme, Published by Centre for Economic Performance London School of Economics and Political Science, July 2002, pg.9;

due to information imperfections, skill mismatch, location mismatch or just something as simple as workers moving slowly\textsuperscript{15} (motivation). The mismatch could increase due to: characteristics of the unemployment, changes in the search effort and method, changes in the search effectiveness, EPL (employment protection legislation) changes, labour market policies and other policies.

**Hysteresis effect:** Upward movement along the Beveridge curve (deterioration of the labour market) can induce an outward shift of the curve!

Furthermore the curve could be read as the trace of the adjustment path towards the steady state or in other words (Bowden, 1980) vacancies adjust more rapidly than unemployment. Following the empiric Beveridge curve this case is visible under the “anticlockwise movement” of the trajectory in the (u,v) space.

2. Beveridge curve in Romania based on Survey Methodology and data measurement of vacancies at regional NUTS 2 level, total, by occupation and by economic activity

As a benefit of the recent data improvement regarding the data on job vacancies in Romania provides an opportunity for the examination on short term shifts (between first Quarter 2005-Third Quarter 2009 and ) of the labour markets at NUTS 1 (4 Macroregions) and NUTS 2 (8 development regions) by using the Beveridge curve. Based on the TEMPO data base developed by INS (National Institute for Statistics) the variable sets are the unemployment rate\textsuperscript{16} (SOM103A - Unemployment rate by gender, macroregions, development regions and counties) and Vacancies rate in two variants by groups of occupations (ISCO-88) (LMV101C - Vacancies rate by macroregions, development regions, groups of occupations (ISCO-88) and by activity of national economy at level of CANE Rev.1 sections (LMV101A - Vacancies rate by macroregions, development regions, activity of national economy at level of CANE Rev.1 sections ). This data is available by annual and quarterly periodicity and according to the territorial distribution, by total economy, macro regions and regions (level 0, 1, and 2 of NUTS). “Data on the vacancies rate are obtained from Job vacancy survey, quarterly statistical sample survey, having as reference period, the middle month of the quarter. Statistical survey is carried out on the same sample used for the production of monthly statistics on earning and number of employees”\textsuperscript{17}. (Box 1)

\textsuperscript{15} HEIDI SOININEN, EMPIRICAL STUDIES ON LABOR MARKET MATCHING, Edita Prima Ltd, Helsingfors 2006 pg.4
\textsuperscript{16} Because is the term restricton I
\textsuperscript{17} https://statistici.insse.ro/shop/
Box 1

INS- (National Institute for Statistics – Romania) Job vacancy survey – comparable data:

**Vacancies rate** = \( \frac{\text{numbers of vacancies}}{\text{total number of jobs}} \) \ [%

where:
Vacancies are considered for those positions of persons outside the enterprise (who can also compete with persons from the enterprise), no matter if these are positions for a definite or indefinite duration, full time or part time.

**Total number of jobs** = \( \text{jobs} \_{\text{occupied}} + \text{jobs} \_{\text{vacant}} - \text{jobs} \_{\text{blocked / meant for promotion inside the enterprise or institution}} \)

**jobs} \_{\text{occupied}} = \text{Number of employees}

Obs:
* The sample for year 2008 counted 24000 economic and social units. Business units with 50 and more employees and budgetary sector units (general government, education, health and social assistance) are exhaustively comprised into the survey.
* According to the territorial distribution, data are available by total economy, macro-regions and regions (level 0, 1, and 2 of NUTS).

**LMV101C - Vacancies rate by macroregions, development regions, groups of occupations (ISCO-88)**
* Military staff and similar are excluded (Ministry of National Defence, Ministry of Administration and Interior, Romanian Intelligence Service, etc.).
* The data are collected and disseminated in accordance with the International Standard Classification of Occupations (ISCO - major group level, excluding major group 0 - armed forces).

2.1. The Beveridge Curve built with unemployment rates (quarterly average calculated with monthly rates) and vacancies (quarterly periodicity reported) by total and by group of occupations ISCO-88 at development regions NUTS 2 level Romania, between first quarter 2005 and third quarter 2009 (19 items), seasonally unadjusted.

**LMV101A - Vacancies rate by macroregions, development regions, activity of national economy at level of CANE Rev.1 section**
* The data for 2005-2007 were collected in accordance with the National Economic Activities Classification (CANE Rev. 1)
* The data for 2008 were estimated according to the new Classification of Activities in the National Economy (CANE Rev.2) harmonised with European classification in the field (NACE Rev.2). Applied estimation method relies on conversion matrix of economic activities defined according to CANE Rev. 1 in economic activities defined according to CANE Rev.2.

2.2. The Beveridge Curve built with unemployment rates (quarterly average calculated with monthly rates) and vacancies (quarterly periodicity reported) by activity of national economy at level of CANE Rev.1 sections (LMV101A - Vacancies rate by macroregions) at development regions NUTS 2 level Romania, between first quarter 2005 and third quarter 2009 (19 items), seasonally unadjusted.

Where:
The idea of a labour market divided into submarkets with different friction and different degrees of efficiency of the matching technology is sustainable by a visual inspection of the relationship \((U,V)\), as in Jackman, Pissarides, and Savouri (1990), Bean (1994), and Gregg and Petrongolo (1997). Börsch-Supan (1991) developed a useful and relatively simple panel approach that uses regional-level data to estimate aggregate Beveridge curves. The regional mismatch exists at NUTS 2 level, with different patterns at regional level, occupational and CANE rev.1 characteristics. Regional mismatch appears to be an important source of labour market mismatch.

3. Beveridge curve in Romania based on administrative Methodology and data measurement of vacancies National Beveridge curves in Romania

The unemployment and the vacancies are based on administrative data following the national law (especially the 76/2002 Law) – the registered stock data. Since 1st March 2002 in Romania employers have had an obligation to report all the vacancies to the National Agency for Employment ANOFM [at any branch – County level (NUTS 3) the closest one to the address] during the first 5 days from the moment of creating the vacancies (mentioned in the article 10/L76/2002) otherwise the fact represents a contravention (Article 113 from the same Law).

Vacant jobs are exhaustively measured by the National Agency for Employment since January 2004 with monthly periodicity but are reported only at national level into “Unemployment and vacant jobs” section. Based on this it is possible to build the longest data time series for the UV, with total number of vacancies and total number of registered unemployment.

The improvement in the labour market monitoring can be seen by the new indicators availability. With this in mind we can consider the “Hiring with a contract for people who exits from unemployment” as an indicator calculated by aggregation of the first 2 items from the list of total exits from unemployment, that offers the image of successful matching. “Quarterly Statistical Bulletin on Labour and Social Protection” (Source: National Agency for Employment):

**Employment, Mobility, Unemployment and Unemployed Social Protection:**
* Unemployed entries and exits of the records of the Agencies for Employment, by causes,
Total exits from unemployment:

1. **Hired with open-ended contracts** - Hiring with a contract for people who exit from unemployment
2. **Hired with fixed-term contracts** - Hiring with a contract for people who exit from unemployment
3. Unjustified denial to take a job or to attend training course
4. Absented due to mandatory visa
5. Non-renewal of job request at the end of entitlement
6. Went abroad
7. Went to the army
8. Retired
9. Deceased
10. Went to prison
11. Went on maternity leave
12. Non-renewal of job request of unpaid unemployed
13. Other situations

This indicator provides the data stock in a monthly periodicity for the time period 01.2006-09.2009.

3.1. The aggregate Beveridge curve for Romania

The national Beveridge curve in Romania using monthly data, seasonally unadjusted presented in Figure 3 permits some comments, such as:

- Romania during the period 01.2004-04.2004 saw an improvement in the labour market functioning as a consequence of increasing quantity of demand. The number of registered unemployed people decreased with 42% and the number of vacancies increase with 86%, the inward shift of the curve indicating a decrease in frictions and an increase in matching;

- During 04.2007-06.2008 a decrease in the quantity of demand was registered, the creation of vacancies slowed down, continuing the decrease of frictions and also the increase in matching, the job hysteresis being seen;

The structural shock effect is visible starting from 09.2008, determined by the decrease of the demand, with the consequence of decreasing the number of vacancies and increasing the rate of unemployment, weak economic activity, (economy is contracting – recession setting in) in periods of weak activity. In this period the movement along the new Beveridge curve (generated by the new demand curve) indicates a fast deterioration of the Romanian labour market functioning – the progresses in the rate of unemployment decreasing meant that in almost 4 years were lost during the last year (and a half). In July 2008 the unemployment rate was 3.7% from 7,7 January 2004 and comes back at 7,8 % in December 2009.

3.2. Estimation of a matching function for Romania

Next to vacancies and unemployment we consider matching of “Hiring with a contract for people who exit from unemployment”. All those 3 indicators are measured in the monthly periodicity during the 01.2006-09.2009 periods – the time series containing 45 terms. Unemployment and vacancies are registered at the end of the month. Unemployment and vacancies are both stock variables while matches is a flow variable. Considering a time lag of one month between unemployment and vacancies and matching the working time series should have 44 observations (see Figure 4).
The literature typically uses a Cobb-Douglas specification for the matching function and estimates this in its log-linear form:

The aggregate matching function:

$$\ln M_t = \alpha + \beta \ln U_{t-1} + \gamma \ln V_{t-1} + \lambda T + \delta Z_t + \epsilon_t (2)$$

where

- $M_t =$ TIME_M (t = 2, ..., 45) time dummy variable
- $U_{t-1} =$ NURt-1 monthly registered number of unemployed persons, lag time 1
- $V_{t-1} =$ NVt-1 monthly registered vacancies, lag time 1
- $Z$ is a vector of possible other relevant variables (characteristics of the unemployed people – education, age, experience on the labour market, rigidities of the labour market, passive policies (level of the unemployment benefit, minimum wage), price of the labour force (real wage), etc/

Using the SPSS programme the simple OLS regression for the equation (2), considering $Z = 0$ offer the following results (see Table 1):

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22 Morten Hansen and Romans Pancs, The Beveridge Curve and the Matching Function: Indicators of Normalization in the Latvian Labour Market, http://www.cERGE.ei.cz/pdf/gdn/RRC1_31_paper_01.pdf (This research was supported by a grant from the CERGE-EI Foundation under a programme of the Global Development Network. All opinions expressed are those of the authors and have not been endorsed by CERGE-EI or the GDN.)

Table 1. Results of the aggregate matching function for Romania using administrative data, during 01.2006-09.2009, in monthly variation

Variables Entered/Removed

Model Variables Entered Variables Removed Method

1 TIME_M, LNNUR, LNNV Enter
a All requested variables entered.
b Dependent Variable: LNNMAT1

I Summary

Model | R | R Square | Adjusted R Square | Std. Error of the Estimate
1 | 0.757 | 0.573 | 0.541 | 0.217

ANOVA

Model | Sum of Squares | df | Mean Square | F | Sig.
1 | Regression | 2,517 | 3 | 0,839 | 17,882 | 0,0000
Residual | 1,877 | 40 | 0,047
Total | 4,394 | 43

Coefficients

Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig.
1 | (Constant) | B | Std. Error | Beta | 0,411 | 0,683
| LNNUR | 0,311 | 0,219 | 0,170 | 1,420 | 0,163
| LNNV | 0,513 | 0,147 | 0,557 | 3,487 | 0,001
| TIME_M | -0,007 | 0,004 | -0,274 | -1,789 | 0,081

Where:

B coefficients of the regression equation
Beta standardized coefficients – I can compare the coefficients – the variable vacancies make the strongest unique contribution to explaining the dependent variable, when the variance explained by all the other variables in the model is controlled for. Also for the vacancies variable the value is making a significant unique contribution to the prediction of the dependent variable - the Sig is less then 0.05. The coefficient for vacancies is consistently significant (but lower then 1)

The elasticity for unemployment $\beta=0.311$ is comparable to previous studies for “Western Europe and North America where, depending on the specification of matches the elasticity $\beta$, is typically between 0.3 and 0.7.”

$\beta - 1=0.311-1 = -0.689$ is a measure of the negative externality caused by unemployed persons on other unemployed persons (congestion). Here, if we believe the results, we cannot reject that there is zero congestion (i.e. the unemployed “do not step on each other’s toes” to get a job).

24 Morten Hansen and Romans Pancs, The Beveridge Curve and the Matching Function: Indicators of Normalization in the Latvian Labour Market, http://www.cERGE.cuni.cz/pdf/gdn/RRCI_31_paper_01.pdf (This research was supported by a grant from the CERGE-EI Foundation under a programme of the Global Development Network. All opinions expressed are those of the authors and have not been endorsed by CERGE-EI or the GDN.)
Likewise $\gamma=0.513$, the elasticity for vacancies, is associated with the positive externality of firms on unemployed persons:

- possible thick-market effect;
- more vacancies represent a positive externality for the unemployed and a negative externality for other firms searching for workers.

Here, there seems to be thick market-effect. In short, vacancies seems to be what creates matches while new unemployment have no significant impact on hiring. In other words is possible that there is a relative offer shortage in the labour market?

$$\beta + \gamma=0.311+0.513=0.824<1 \quad (3)$$

the matching function has returns that are decreasing (decreasing returns to scale) or with the same sense "diseconomies of scale" or "increasing costs" (3).

In Romania the matching seems to rely on vacancies, the vacancies coefficient is positive and significant monthly variation of matching/successfully hiring. The time trend is not consistently highly significant – and negative. The matching efficiency is variable over time.

In literature there are studies that treats Beveridge curve in regional/geographical disaggregation like e.g Wall and Zoega (2001) or occupational disaggregation e.g. like Fahr and Sunde (2001). “Armstrong and Taylor (1980) suggest decomposing structural unemployment even further in a geographical, an occupational, and a simultaneous occupational-geographical component for regional studies” 25

4. Spatial perspective

Even for Romania, at this moment there is sufficient data (4 year with annual /quarterly data) that offer the conditions to study the Beveridge curve in occupational and regional terms but also in economic activity and regional disaggregation. (see Figure 4). To analyse and to identify possible spatial patterns some maps can be constructed using the tools from GeoDa:

a. In Figure 5 are presented the Box maps (Hinge =3.0) for Romania at NUTS 2 level with: the average of the unemployment rate for the first quarter 2005 (a1) and for the first quarter 2008 (a2); the vacancies rate for the first quarter 2005 (b1) and for the first quarter 2008 (b2);

b. Conditional map for the quarterly average unemployment registered rate and vacancies rate distribution among the NUTS 2 level regions in 2009 Q3/third quarter, data source:

25 Peter Rodenburg, The Remarkable Place of the UV Curve in Economic Theory, Ti 2007-088/1, Tinbergen Institute Discussion Paper, University of Amsterdam, and Tinbergen Institute.
TEMPO, INS) figure 6. Visual investigation of the spatial distribution indicates some possible patterns.

There are no outliers in the map (Figure 5) There are spatial variation for the vacancies distribution between 2005 and 2008 (moments) but not a significant changes for the unemployment.
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Beveridge Curve at regional NUTS 2 level, quarterly variation (Source: TEMPO data, INS)
Box maps (Hinge=3.0) for Romania at NUTS 2 level

a1) average of the unemployment rate for the first quarter 2005

a2) average of the unemployment rate for the first quarter 2008

b1) the vacancies rate for the first quarter 2005

b2) the vacancies rate for the first quarter 2008
Conditional map for the quarterly average unemployment registered rate and vacancies rate distribution among the NUTS 2 level regions in Romania (2009 Q3 / third quarter; data source: TEMPO, INS).
4.1. The spatial weights file creation

Using the Rook Contiguity Weight File (based on the rook criteria, where “the neighbor is based on sharing a common boundary”\(^{26}\)) and considering again as event the vacancies rates and as the base the unemployment rate, we present the spatially smoothed maps.

**Figure 7. Connectivity Histogram: Rook connectivity for NUTS 1 and NUTS 2 regions**

It is important to emphasise the bimodal distribution for the NUTS 2 rook connectivity Histogram (see Figure 7). In this case there is one region (Bucharest Ilfov) with only one neighbour and there is the Centre region with 5 neighbours (almost many neighbours)

4.2. Spatially Smoothed Maps

Using the Empirical Bayes Smoothing (EB technique: “In essense, the EB technique consists of computing a weighted average between the raw rate for each county and the state average, with weights proportional to the underlying population at risk. Simply put, small counties (i.e., with a small population at risk) will tend to have their rates adjusted considerably, whereas for larger counties the rates will barely change.”\(^{27}\)) considering as an event “the vacancies rate” and as population at risk “the rate of unemployed” we present below the **Spatially smoothed Box map** (with a Hinge of 1,5) for Romania for NUTS 1 and NUTS 2 for the years 2005-2008 (data source: TEMPUS/INS), using the Rook Contiguity Weight File in the Figures 8 and 9. For the NIUTS 1 level (there are only 4 macroregions) so it is difficult to emphasize broad regional patterns but for NUTS 2 level is possible to sketch some tendencies. For the variable mentioned there is no stable pattern either at NUTS level 2 and 1 during the period 2005-2008 (using annual data).

\(^{26}\) Luc Anselin Exploring Spatial Data with GeoDaTM : A WorkbookSpatial Analysis Laboratory Department of Geography University of Illinois, Urbana-Champaign Urbana, IL 61801, http://sal.uiuc.edu/Pg.6, Center for Spatially Integrated Social Science http://www.csiss.org/Revised Version, March 6, 2005, pg.106

\(^{27}\) Luc Anselin Exploring Spatial Data with GeoDaTM : A WorkbookSpatial Analysis Laboratory Department of Geography University of Illinois, Urbana-Champaign Urbana, IL 61801, http://sal.uiuc.edu/Pg.6, Center for Spatially Integrated Social Science http://www.csiss.org/Revised Version, March 6, 2005, pg.99
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Figure 8. Spatially smoothed Box map (with a Hinge of 1,5) for Romania for NUTS 1 regions vacancies rates over unemployment rate for the years 2005-2008 (data source: TEMPUS/INS), using the Rook Contiguity Weight File
c. Spatially smoothed (vacancies rate over unemployment rate) Box map (with a Hinge of 1.5) for Romania for NUTS 2, in 2007

d. Spatially smoothed (vacancies rate over unemployment rate) Box map (with a Hinge of 1.5) for Romania for NUTS 2, in 2008

**Figure 8. Spatially smoothed Box map (with a Hinge of 1.5) for Romania for NUTS 1 regions vacancies rates over unemployment rate for the years 2005-2008 (data source: TEMPUS/INS), using the Rook Contiguity Weight File**

### 4.2. Spatial Lag Construction

Using the Moran’s I (spatial statistic, see BOX1) tool we tried to measure the spatial autocorrelation based on “on both feature locations and feature values simultaneously” with a view to identify if there is a pattern expressed as “clustered, dispersed or random” for the 2 variables from the Beveridge curve: the unemployment and vacancies with NUTS 2 and NUTS3 data..

Those 2 variables were linked with the locations from the map in Arc GIS 9.3. (Arc GIS Catalog and Arc MAP). With the Arc GIS software was aggregated the NUTS 2 region’s map for Romania (the map for development regions) into NUTS 1 region’s map for Romania (the map for macroregions). Spatial econometrics through the GeoDa software has some applications like Bivariate Moran as a part of spatial Lag Construction. In table 2 there is calculated the bivariate Moran’s I in order to measure the level of correlation between the value of the variable x represented by the annual rate of the vacancies by NACE 1 and by occupation ISCO 88 at a specific location with the weighted average of the second variable the annual registered unemployment rate calculated as the average over the neighbouring locations (using the Rook Contiguity Weight matrix RegiuniAn.GAL).

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28 Attila Varga, Introduction to Applied Spatial Econometrics, course presentation, DIMETIC Pécs, July 3, 2009; 29 The GeoDa Center for Geospatial Analysis and Computation succeeds the Spatial Analysis Laboratory (SAL) which was founded by the new School of Geographical Sciences Director Luc Anselin while at the University of Illinois. http://geodacenter.asu.edu/about
The **spatial autocorrelation coefficient (the slope of the regression line)** is considered as:

a) high-high and low-low locations for positive spatial autocorrelation (positive local spatial autocorrelation) are typically referred to as spatial clusters, (not single locations);

b) low-high and high-low locations for negative spatial autocorrelation are termed spatial outliers (single locations)

Dimensions of the Moran I are very close to 0 with some variations that could express tendencies:

**a. for vacancies rate by NACE1 is between**

a1. Negative significant correlation (dispersion tendency)
   
   for J- *Financial intermediation* (2006-2005) the I is over (-0.2178) with the negative maximum of -0.2339,
   
   E - *Electric and thermal energy, gas and water* (2007, 2005, 2006) the I €[0.2114-0.1897]
   
   There are also significant negative values for I *Transports, storage and telecommunications* for (2007, 2008),
   
   If is increasing the vacancies rate in this sectors then is decreasing the unemployment rate of neighbours (stimulates the geographic mobility) dissimilarity effect (i not the same)

a2. Positive significant correlation (clustering tendency)

   H *Hotels and restaurants* (2007) with the I=0.1964
   
   A *Agriculture, hunting and forestry* ( 2006) with I=0.1862
   
   If the unemployment rate of the neighbours are rising then it is increasing the vacancies in the H and A sectors with similar effect;

b. for vacancies rate by ISCO 88 is between

b1. G8 (Operators for installations, machinery and equipment) negative correlation tendency, significant for all the years of analysis (2005-2008); Maximum I negative for G7 in 2007 with the value (-0.1798);

b2. G1 (Members of legislative, executive, senior officials of public administration, managers and clerks of economic, social and political units), G2 (Experts with intellectual and scientific occupations), G6 (Farmers and skilled workers in agriculture, forestry and fishing) positive correlation tendency with the neighbours unemployment and significant for the years 2005, 2006 and 2007 with \( I \in [0.1024-0.1897, 0.1897] \) the maximum value of the I (G6 in 2007).

The values and the sign of the bivariate Morran I offers information of a similar behaviour of the ISCO 88 major group of occupation at NUTS 2 level with the dissimilar/divergent vacancies rate variation against the variation unemployment rate of the neighbours for major groups of occupations: G8 (Operators for installations, machinery and equipment) and with similar vacancies rate variation against the variation unemployment rate of the neighbours for the ISCO 88 major groups of occupations G1 (Members of legislative, executive, senior officials of public administration, managers and clerks of economic, social and political units), G2 (Experts with intellectual and scientific occupations), G6 (Farmers and skilled workers in agriculture, forestry and fishing).

For the vacancies rate by NACE.1. is more likely to be dissimilar/divergent with neighbours variation unemployment rate against the vacancies rate by ISCO 88 that are more likely to be similar the variation unemployment rate of the neighbours, at NUTS 2 level.

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**How Spatial Autocorrelation: Moran's I (Spatial Statistics) works**

This tool measures spatial autocorrelation (feature similarity) based on both feature locations and feature values simultaneously. Given a set of features and an associated attribute, it evaluates whether the pattern expressed is clustered, dispersed, or random. The tool calculates the Moran's I Index value and both a Z score and p-value evaluating the significance of that index. In general, a Moran's Index value near +1.0 indicates clustering while an index value near -1.0 indicates dispersion. However, without looking at statistical

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significance you have no basis for knowing if the observed pattern is just one of many, many possible versions of random.

In the case of the Spatial Autocorrelation tool, the null hypothesis states that "there is no spatial clustering of the values associated with the geographic features in the study area". When the p-value is small and the absolute value of the Z score is large enough that it falls outside of the desired confidence level, the null hypothesis can be rejected. If the index value is greater than 0, the set of features exhibits a clustered pattern. If the value is less than 0, the set of features exhibits a dispersed pattern.

\[
I = \frac{n \sum_{i=1}^{n} \sum_{j=1}^{n} w_{i,j} z_i z_j}{S_0 \sum_{i=1}^{n} z_i^2}
\]

where \( z_i \) is the deviation of an attribute for feature \( i \) from its mean \( (x_i - \bar{X}) \), \( w_{i,j} \) is the spatial weight between feature \( i \) and \( j \), \( n \) is equal to the total number of features, and \( S_0 \) is the aggregate of all the spatial weights:

\[
S_0 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_{i,j}
\]

The \( z_I \)-score for the statistic is computed as:

\[
z_I = \frac{I - E[I]}{\sqrt{V[I]}}
\]

where:

\[
E[I] = \frac{-1}{(n - 1)}
\]

\[
V[I] = E[I^2] - E[I]^2
\]

Additional calculations are as follows:

\[
E[I^2] = \frac{A - B}{C}
\]

\[
A = n \left[ (n^2 - 3n + 3)S_1 - nS_2 + 3S_0^2 \right]
\]

\[
B = D \left[ (n^2 - n)S_1 - 2nS_2 + 6S_0^2 \right]
\]

\[
C = (n - 1)(n - 2)(n - 3)S_0^2
\]

\[
D = \left( \frac{\sum_{j=1}^{n} z_j^4}{\sum_{j=1}^{n} z_j^2} \right)^2
\]

\[
S_1 = (1/2) \sum_{i=1}^{n} \sum_{j=1}^{n} (w_{i,j} + w_{j,i})^2
\]

\[
S_2 = \sum_{i=1}^{n} \left( \sum_{j=1}^{n} w_{i,j} + \sum_{j=1}^{n} w_{j,i} \right)^2
\]

The p-value is a numerical approximation of the area under the curve for a known distribution, limited by the test statistic.
### Table 2a

#### Bivariate Moran (regiuniAn.gal) (NUTS2)

<table>
<thead>
<tr>
<th>X variable</th>
<th>Y lagged variable</th>
<th>Moran’s I</th>
<th>p</th>
<th>Mean</th>
<th>Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMV05 W RSIO5</td>
<td>-0.023</td>
<td>0.686</td>
<td>-0.1354</td>
<td>0.2243</td>
<td></td>
</tr>
<tr>
<td>LMV05 W RSIO6</td>
<td>-0.0144</td>
<td>0.636</td>
<td>-0.1392</td>
<td>0.229</td>
<td></td>
</tr>
<tr>
<td>LMV07 W RSIO7</td>
<td>-0.0276</td>
<td>0.471</td>
<td>-0.1517</td>
<td>0.2347</td>
<td></td>
</tr>
<tr>
<td>LMV08 W RSIO8</td>
<td>0.097</td>
<td>1</td>
<td>-0.1394</td>
<td>0.2222</td>
<td></td>
</tr>
</tbody>
</table>

| LMVA05 W RSIO5 | 0.006 | 0.999 | -0.1464 | 0.1923 |
| LMVA06 W RSIO6 | 0.1862 | 0.001 | -0.1381 | 0.1816 |
| LMVA07 W RSIO7 | -0.0092 | 0.999 | -0.153 | 0.2367 |
| LMVA08 W RSIO8 | 0.097 | 0.001 | -0.1581 | 0.223 |

| LMC05 W RSIO5 | -0.0758 | 0.001 | -0.1429 | 0.1457 |
| LMC06 W RSIO6 | 0.0555 | 0.999 | -0.146 | 0.1056 |
| LMC07 W RSIO7 | -0.0714 | 0.398 | -0.1429 | 0.196 |
| LMC08 W RSIO8 | 0.0372 | 0.587 | -0.1484 | 0.1821 |

| LMD05 W RSIO5 | -0.1055 | 0.001 | -0.1313 | 0.2298 |
| LMD06 W RSIO6 | -0.1184 | 0.001 | -0.1329 | 0.1743 |
| LMD07 W RSIO7 | -0.1762 | 0.001 | -0.1522 | 0.1725 |
| LMD08 W RSIO8 | 0.0027 | 0.531 | -0.1315 | 0.2198 |

| LME05 W RSIO5 | -0.2009 | 0.001 | -0.1344 | 0.2338 |
| LME06 W RSIO6 | -0.1897 | 0.001 | -0.1487 | 0.2168 |
| LME07 W RSIO7 | -0.2114 | 0.001 | -0.1487 | 0.2299 |
| LME08 W RSIO8 | 0.0092 | 0.001 | -0.1484 | 0.2121 |

| LMV05 W RSIO5 | 0.0194 | 0.999 | -0.1353 | 0.23 |
| LMV06 W RSIO6 | -0.1711 | 0.718 | -0.125 | 0.2105 |
| LMV07 W RSIO7 | -0.1508 | 0.001 | -0.1446 | 0.1592 |
| LMV08 W RSIO8 | -0.0608 | 0.001 | -0.1393 | 0.2263 |

| LMV05 W RSIO5 | -0.0283 | 0.356 | -0.1372 | 0.2034 |
| LMV06 W RSIO6 | 0.0299 | 0.675 | -0.138 | 0.1803 |
| LMV07 W RSIO7 | 0.0211 | 0.999 | -0.1534 | 0.1494 |
| LMV08 W RSIO8 | -0.0506 | 0.105 | -0.1495 | 0.2075 |

| LMM05 W RSIO5 | 0.0178 | 0.999 | -0.1344 | 0.2366 |
| LMM06 W RSIO6 | -0.0173 | 0.919 | -0.1455 | 0.0964 |
| LMM07 W RSIO7 | 0.1964 | 0.001 | -0.1416 | 0.1919 |
| LMM08 W RSIO8 | 0.0012 | 0.999 | -0.153 | 0.2142 |

| LMI05 W RSIO5 | -0.1022 | 0.001 | -0.149 | 0.2034 |
| LMI06 W RSIO6 | -0.0094 | 0.0999 | -0.1423 | 0.2108 |
| LMI07 W RSIO7 | -0.1602 | 0.001 | -0.1356 | 0.186 |
| LMI08 W RSIO8 | -0.1441 | 0.001 | -0.1468 | 0.2221 |

| LMA05 W RSIO5 | -0.2178 | 0.001 | -0.1459 | 0.2215 |
| LMA06 W RSIO6 | -0.2339 | 0.001 | -0.1551 | 0.2181 |
| LMA07 W RSIO7 | -0.0332 | 0.471 | -0.1517 | 0.2339 |
| LMA08 W RSIO8 | -0.0191 | 0.999 | 0.1566 | 0.2185 |

| LMN05 W RSIO5 | -0.0452 | 0.339 | -0.1429 | 0.3422 |
| LMN06 W RSIO6 | -0.0096 | 0.999 | -0.175 | 0.2067 |
| LMN07 W RSIO7 | -0.1765 | 0.001 | -0.1467 | 0.2083 |
| LMN08 W RSIO8 | -0.1418 | 0.001 | -0.1372 | 0.2055 |

| LMC05 W RSIO5 | 0.0242 | 0.75 | -0.1348 | 0.1939 |
| LMC06 W RSIO6 | 0.0168 | 0.812 | -0.1451 | 0.1273 |
| LMC07 W RSIO7 | -0.0619 | 0.001 | -0.1369 | 0.2016 |
| LMC08 W RSIO8 | 0.104 | 0.15 | -0.1441 | 0.2151 |

| LMD05 W RSIO5 | -0.127 | 0.001 | -0.1401 | 0.2324 |
| LMD06 W RSIO6 | -0.1182 | 0.001 | -0.1457 | 0.2074 |
| LMD07 W RSIO7 | -0.0619 | 0.001 | -0.145 | 0.205 |
| LMD08 W RSIO8 | -0.0384 | 0.16 | -0.1405 | 0.2154 |

| LME05 W RSIO5 | -0.0021 | 0.999 | -0.1327 | 0.186 |
| LME06 W RSIO6 | -0.1076 | 0.001 | -0.1415 | 0.1317 |
| LME07 W RSIO7 | -0.1039 | 0.001 | -0.1388 | 0.1268 |
| LME08 W RSIO8 | -0.0722 | 0.001 | -0.1373 | 0.2069 |

Where:

- $p$ pseudo significance level calculated (for 999 permutation the most significant $p$ level is 0.001)
- $E[I]$ Theoretical mean (which is -0.1429)
- Mean of empirical distribution
- Sd standard deviation of the empirical distribution

**x variable:**

**LMVXyy**

LMV rate of the vacancies from X sector at NUTS2 level

- **aX sector (NACE Rev.1) codification:**
  - A Agriculture, hunting and forestry
  - B Fishing and fish farming
  - C Mining and quarrying
  - D Manufacturing
  - E Electric and thermal energy, gas and water
  - F Construction
  - G Trade
  - H Hotels and restaurants
  - I Transports, storage and telecommunications
  - J Financial intermediation
  - K Real estate transaction and other service activities
  - L Public administration and defence
  - M Education
  - N Health and social work
  - O Other activities of national economy


**Y lagged variable:**

Annual $y$ registered unemployment rate calculated as the average over the neighbouring locations (using the Rook Contiguity Weight matrix RegiuniAn.GAL).

See also Annex 1 for the example maps (significance maps, Moran scatter points)
### Table 2b

**Bivariate Moran (regiuniAn.gal) (NUTS2)**

<table>
<thead>
<tr>
<th>X variable</th>
<th>Y lagged variable</th>
<th>Moran’s I</th>
<th>p apparent</th>
<th>Mean</th>
<th>Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMVG105</td>
<td>W_RSI05</td>
<td>0.1024</td>
<td>0.001</td>
<td>-0.1442</td>
<td>0.1979</td>
</tr>
<tr>
<td>LMVG106</td>
<td>W_RSI06</td>
<td>0.1483</td>
<td>0.001</td>
<td>-0.1384</td>
<td>0.1578</td>
</tr>
<tr>
<td>LMVG107</td>
<td>W_RSI07</td>
<td>0.1445</td>
<td>0.001</td>
<td>-0.1342</td>
<td>0.1644</td>
</tr>
<tr>
<td>LMVG108</td>
<td>W_RSI08</td>
<td>-0.0028</td>
<td>0.999</td>
<td>-0.1445</td>
<td>0.2343</td>
</tr>
</tbody>
</table>

| Randomisation / no of permutation 999 |

<table>
<thead>
<tr>
<th>E[I]</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.1429</td>
</tr>
</tbody>
</table>

| LMVG205    | W_RSI05           | 0.1024    | 0.001      | -0.1442 | 0.1958 |
| LMVG206    | W_RSI06           | 0.1483    | 0.001      | -0.1366 | 0.1542 |
| LMVG207    | W_RSI07           | 0.1445    | 0.001      | -0.1456 | 0.1648 |
| LMVG208    | W_RSI08           | -0.0028   | 0.999      | -0.1527 | 0.2308 |

| LMVG305    | W_RSI05           | -0.0713   | 0.001      | -0.5094 | 0.2259 |
| LMVG306    | W_RSI06           | -0.0474   | 0.111      | -0.1346 | 0.1778 |
| LMVG307    | W_RSI07           | -0.0644   | 0.001      | -0.1429 | 0.224 |
| LMVG308    | W_RSI08           | 0.0296    | 0.788      | -0.154  | 0.2237 |

| LMVG405    | W_RSI05           | -0.0266   | 0.323      | -0.1434 | 0.215 |
| LMVG406    | W_RSI06           | -0.0594   | 0.237      | -0.1546 | 0.2155 |
| LMVG407    | W_RSI07           | -0.0504   | 0.04       | -0.1599 | 0.231 |
| LMVG408    | W_RSI08           | 0.0173    | 0.735      | -0.1496 | 0.2256 |

| LMVG505    | W_RSI05           | -0.0026   | 0.999      | -0.1434 | 0.1951 |
| LMVG506    | W_RSI06           | -0.0206   | 0.685      | -0.1453 | 0.1915 |
| LMVG507    | W_RSI07           | -0.0504   | 0.001      | -0.1455 | 0.2421 |
| LMVG508    | W_RSI08           | -0.1052   | 0.001      | -0.1423 | 0.2226 |

| LMVG605    | W_RSI05           | 0.1675    | 0.001      | 0.1444 | 0.2007 |
| LMVG606    | W_RSI06           | 0.1672    | 0.001      | -0.1416 | 0.1609 |
| LMVG607    | W_RSI07           | 0.1897    | 0.001      | -0.1431 | 0.1155 |
| LMVG608    | W_RSI08           | 0.0592    | 0.119      | -0.1429 | 0.1282 |

| LMVG705    | W_RSI05           | -0.0475   | 0.125      | -0.1447 | 0.2191 |
| LMVG706    | W_RSI06           | -0.0514   | 0.006      | -0.1376 | 0.227 |
| LMVG707    | W_RSI07           | -0.1798   | 0.001      | -0.1422 | 0.2162 |
| LMVG708    | W_RSI08           | -0.0135   | 0.631      | -0.1349 | 0.2292 |

| LMVG805    | W_RSI05           | -0.1617   | 0.001      | -0.1373 | 0.2121 |
| LMVG806    | W_RSI06           | -0.1244   | 0.001      | -0.1484 | 0.1757 |
| LMVG807    | W_RSI07           | -0.1176   | 0.001      | -0.1461 | 0.1987 |
| LMVG808    | W_RSI08           | 0.0283    | 0.685      | -0.1456 | 0.2316 |

b. **X group of occupation codification**

<table>
<thead>
<tr>
<th>Group of occupations(ISCO-88) codification</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 Members of legislative, executive, senior officials of public administration, managers and clerks of economic, social and public services</td>
</tr>
<tr>
<td>G2 Experts with intellectual and scientific occupations</td>
</tr>
<tr>
<td>G3 Technicians, foremen and assimilated</td>
</tr>
<tr>
<td>G4 Administrative clerks</td>
</tr>
<tr>
<td>G5 Workers in services and trade and assimilated</td>
</tr>
<tr>
<td>G6 Farmers and skilled workers in agriculture, forestry and fishing</td>
</tr>
<tr>
<td>G7 Artisans and skilled workers in handicraft, machinery and equipment regulation and maintenance</td>
</tr>
<tr>
<td>G8 Operators for installations, machinery and equipment</td>
</tr>
<tr>
<td>G9 Unskilled workers</td>
</tr>
</tbody>
</table>
Conclusions

The simultaneous existence of vacancies and unemployment could be explained through the view of a national single labour market as a dynamic system described by the interactions of the regional/local labour markets viewed as the “functional compartments” of it.

The aggregate matching function for Romania’s calculations, using administrative (reliable) data, during 01.2006-09.2009, as a monthly variation offers as the main conclusion vacancies seem to be what creates matches while new unemployment has no significant impact on hiring and also seems to be thick market-effect. In Romania the matching seems to rely on vacancies, the vacancies coefficient is positive and significant monthly variation of matching/successfully hiring. The time trend is not consistently highly significant – and negative. The matching efficiency is variable over time.

As a benefit of the recent data improvement regarding the data on job vacancies in Romania provides an opportunity for the examination in short term shifts (between first Quarter 2005 and Third Quarter 2009) of the labour markets at NUTS 1 (4 Macroregions) and NUTS 2 (8 development regions) by using the Beveridge curve “Data on the vacancies rate are obtained from Job vacancy survey, quarterly statistical sample survey, having as the reference period, the middle month of the quarter. The statistical survey was carried out on the same sample used for the production of monthly statistics on earning and number of employees

Using the Moran’s I (spatial statistic, see BOX1) tool we tried to measure the spatial autocorrelation based on “on both feature locations and feature values simultaneously” in order to identify if there is a pattern expressed as ”clustered, dispersed or random” for the 2 variables from the Beveridge curve: the unemployment and vacancies with NUTS 2 and NUTS3 data..

Those 2 variables were linked with the locations from the map in Arc GIS 9.3. (Arc GIS Catalog and Arc MAP). With the Arc GIS software was aggregated the NUTS 2 region’s map for Romania (the map for development regions) into NUTS 1 region’s map for Romania (the map for macroregions). Spatial econometrics through the GeoDa software has some applications like Bivariate Moran as a part of spatial Lag Construction. In the table 2 there is calculated the bivariate Moran’s I in view to measure the level of correlation between the value of the variable x represented by the annual rate of the vacancies by NACE 1 and by occupation ISCO 88 at a specific location with the weighted average of the second variable
the annual registered unemployment rate calculate as the average over the neighbouring locations (using the Rook Contiguity Weight matrix RegiuniAn.GAL).

The values and the sign of the bivariate Morran I offers the information of a similar behaviour to the ISCO 88 major group of occupation at NUTS 2 level with the dissimilar/divergent vacancies rate variation against the variation unemployment rate of the neighbours for major groups of occupations: G8 (Operators for installations, machinery and equipment) and with similar vacancies rate variation against the variation unemployment rate of the neighbours for the ISCO 88 major groups of occupations G1 (Members of legislative, executive, senior officials of public administration, managers and clerks of economic, social and political units), G2 (Experts with intellectual and scientific occupations), G6 (Farmers and skilled workers in agriculture, forestry and fishing)/ (see Table 3).

Table 3

The values and the sign of the bivariate Morran I vacancies rate variation against the variation unemployment rate of the neighbours for

<table>
<thead>
<tr>
<th>NUTS 2</th>
<th>Similar</th>
<th>Dissimilar (↑Vr – neighbors ↓Ur)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISCO 88</td>
<td><strong>G1</strong> (Members of legislative, executive, senior officials of public administration, managers and clerks of economic, social and political units), (2005, 2006 and 2007)</td>
<td><strong>G8</strong> (Operators for installations, machinery and equipment) (2005-2008)</td>
</tr>
<tr>
<td></td>
<td><strong>G2</strong> (Experts with intellectual and scientific occupations), (2005, 2006 and 2007)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>G6</strong> (Farmers and skilled workers in agriculture, forestry and fishing) (2005, 2006, max 2007)</td>
<td></td>
</tr>
<tr>
<td>CANE rev1</td>
<td><strong>H</strong> Hotels and restaurants (2007) with the I=0.1964</td>
<td><strong>J</strong> Financial intermediation (2006-2005)</td>
</tr>
<tr>
<td></td>
<td><strong>A</strong> Agriculture, hunting and forestry (2006) with I=0.1862</td>
<td><strong>E</strong> Electric and thermal energy, gas and water (2007, 2005, 2006)</td>
</tr>
<tr>
<td></td>
<td><strong>I</strong> Transports, storage and telecommunications for (2007, 2008)</td>
<td></td>
</tr>
</tbody>
</table>

For the vacancies rate by NACE.1. is more likely to be dissimilar/divergent with neighbours variation unemployment rate against the vacancies rate by ISCO 88 that are more likely to be similar the variation unemployment rate of the neighbours, at NUTS 2 level.
Annex 1

Bivariate Moran (regiuniAn.gal) (NUTS2) – example maps
References


Hansenand, M., Pancs, R. (2002), “The Beveridge Curve and the Matching Function: Indicators of Normalization in the Latvian Labour Market”, http://www.cerge.cuni.cz/pdf/gdn/RRCI_31_paper_01.pdf (This research was supported by a grant from the CERGE-EI Foundation under a programme of the Global Development Network. All opinions expressed are those of the authors and have not been endorsed by CERGE-EI or the GDN.).


Nickell, S., Nunziata, L.,Ochel, W., Quintini, G. (2002), “The Beveridge Curve, Unemployment and Wages in the OECD from the 1960s to the 1990s”, This paper was produced as part of the Centre’s Labour Markets Programme, Published by Centre for Economic Performance London School of Economics and Political Science, July 2002, pp. 13.


The GeoDa Center for Geospatial Analysis and Computation succeeds the Spatial Analysis Laboratory (SAL) which was founded by the new School of Geographical Sciences Director Luc Anselin while at the University of Illinois. http://geodacenter.asu.edu/about.


***https://statistici.insse.ro/shop/.