THE SOURCES OF REGIONAL UNEMPLOYMENT: A DECOMPOSITION APPROACH*

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Abstract: Regions within a country may have different sources and structure of unemployment and, thus, may need different kinds of regional policies to mitigate it. This paper proposes a method to decompose regional unemployment rates into natural, structural and demand-driven components and applies this method to the data on Ukrainian minor administrative units for 2001-2005. The application of the proposed decomposition method shows that the natural unemployment is a dominant type for majority of minor administrative units. The main results are robust to changes in the model specification and are stable over time and across regions.

Keywords: unemployment rate, decomposition, types of unemployment, regional policy, transition economy, Ukraine

JEL classification: J64; H73; O18; R11

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1. Introduction

High rates of unemployment, and especially long-term unemployment, is a factor often related to the wellbeing of local population (Elhorst 2003). For that reason, low unemployment rate is a target of various policies and programs around the world. Examples of such policies include, but are not limited to, macroeconomic policies facilitating aggregate economic growth and greater stability of economic cycles. Other policies promote changes in relative wages, inclusion of unskilled versus skilled workers and of youth versus adults into the pool of employed. They also include direct wage subsidies or employment tax credits, unemployment insurance, education, training and re-training, etc. Undoubtedly, unemployment could also be affected by policies outside the labor market. Business climate and infrastructure improvements may facilitate development of small and medium-sized businesses, which are typically important job generators. However, there is no consistency in the empirical results about the effectiveness of such policies. Some authors fined no significant relationship between policies and economic development outcomes (including unemployment), while findings of others vary greatly (Nizalov and Loveridge 2005; Bartik 1991; Goss and Phillips 1999; Buss 2001). One possible source of differences in empirical findings may be a misapplication of policy treatment. If a policy affects a specific type of unemployment – natural, structural or demand-driven (McConnell et al. 2003), miss-application may have no or even negative effect. For example, if a more generous unemployment insurance program is applied to a region with a high natural unemployment, it may increase the unemployment rate by increasing a reservation wage.

Following the previous literature, reviewed in section two, this paper offers a method to decompose observed regional unemployment rates into natural, structural and demand-driven components using data for Ukraine for 2001-2005. The method is presented in section three.

Section four describes the data, while section five presents the application results. Section six concludes the paper with policy recommendations and discussion of implications.

2. Conceptual framework and previous literature

Traditionally, unemployment is considered from macroeconomic perspectives focusing on explanation of unemployment disparities and resulting inefficiencies across countries (e. g., Beenstock 1988; Malinvaud 1994; OECD 1994; Scarpetta 1996). At the same time, a large variation in unemployment rates has been documented among sub-national regions. However, this phenomenon has started attracting attention of researchers only recently. Elhorst (2003) emphasizes importance of considering unemployment from a regional perspective. On the one hand the magnitudes of regional differences within countries are much larger than across countries. Therefore, the inefficiencies created by these differences can be considerably larger than those discussed at the macro level. On the other hand, the macroeconomics literature does not explain the existence of these regional unemployment disparities, which in fact tend to persist over time (e.g., Evans and McCormick 1994; Overman and Puga 2002; Grey 2004).

Heterogeneity in spatial distribution of unemployment can be seen either as a disequilibrium phenomenon (Marston 1985) or as a steady-state, being a function of region specific factors such as natural amenities, institutions and infrastructure (Rosen 1974; Blanchard 2006). These factors differ from one region to another and translate into a distribution of unemployment. In practice, these two view points complement each other since they represent different sources or types of unemployment. Thus, an observed unemployment rate U_{it} in a region i in year t can be represented as a combination of natural steady-state U^n, and disequilibrium components of structural (longer term) U^s and demand-driven (short term) U^d unemployment rates:

$$U_{it}=U^n_i+U^s_{it}+U^d_{it} \qquad (1)$$

The *natural* (also called frictional) rate of unemployment includes wait and search unemployment. This type of unemployment originates from both movements of people between regions and jobs and through different stages of their career. Some examples of this type could be unemployment of individuals who follow their spouses transferring jobs, or that of students who search for jobs after graduation.

Natural unemployment may also vary across regions due to differences in productivity and opportunity costs for local residents, distribution of wages, quality of social security networks and human capital of the labor force (for review see Elhorst 2003; Johnson and Layard 1986). For example, residents of rural areas may have income from household production which increases an opportunity cost for out-of-farm employment. This higher cost may explain a higher natural rate of unemployment in rural areas. Even within rural and urban areas we may observe a variation in the natural rates due to region specific frictions in the labor and housing markets.

Movement of workers and jobs can help decrease differences among regional labor markets. But limited transferability, high transportation cost, housing market imperfections may slow down the convergence process (Schiff 2006). Population age structure and natural population growth rate also contribute to the differences in the natural rates (Elhorst 2003).

The *structural* unemployment results from changes in industry composition of regional labor markets and reflects a mismatch between the supply of and the demand for workers. These mismatches occur when the demand for one kind of labor is rising while the demand for another kind is falling, and the supplies are slow to adjust. Structural imbalance is observed when certain sectors grow while others decline. Lilien (1982) suggests that frictions associated with the reallocation of labor across sectors of the economy accounted for as much as half of all fluctuations in unemployment. The major structural shift is associated with the decline in manufacturing and agriculture, and growth in service sectors (Norton 1986; Wright 1987; Page and Walker 1991). However, often employment growth in services is not sufficient to offset the loss of jobs in the declining sectors (OECD 1992). Schiff (2006) explains regional differences in

unemployment in Central and Eastern European countries mostly by structural change in heavy industry and mining. Sectoral shocks lead to permanent reallocations of labor, and imply long spells of unemployment. Displaced workers have to move to other sectors or regions.

Finally, the *demand-driven* (also called cyclical) unemployment is caused by recent shocks to the local labor demand and can persist for several years (Blanchard and Katz 1992). The unemployment returns to its natural rate as wages and a stock of labor respond to the shock through migration and commuting (Blanchard et al. 1992; Goetz 1999). Partridge and Rickman (1997) find that the shocks affect also neighboring areas through the labor mobility, supply and demand linkages. Several studies look at the labor demand shock through employment growth and confirmed its negative relationship with unemployment rate (Fleisher and Rhodes 1976; Van der Veen and Evers 1983; Summers 1986; Hyclak 1996).

Thus, the observed regional unemployment reflects a distribution of long-term natural rates as well as a distribution of temporary shocks to the labor demand. But the importance of natural, structural and demand-driven components may be different for a particular region. It also implies that a policy response to regional unemployment should be different depending on the dominant type of unemployment. However, a practical question remains open: if we observe only the overall rate of employment, how to distinguish the regions with different dominant types of unemployment. An attempt to address this issue is made by Holzer (1993). However, this study does not fully address the dynamic nature of structural and demand-deficient unemployment and does not address the issue of stable differentials in the natural rates found in the recent literature (e.g., Grey 2004). The following section offers an approach that improves a decomposition methodology by addressing the above mentioned limitations.

3. Model specification

A proposed regression-based decomposition model takes the following form:

$$\frac{U_{it}}{\overline{U}_t} - 1 = \sum_{k=1}^{N} \delta_k D_k + \beta_1 R_{it} + \beta_2 \Delta X_{it} + \beta_3 \Delta X_{it-1} + \beta_4 \Delta Xn_{it} + \beta_5 \Delta Xn_{it-1} + e_{it} \qquad (2)$$

where $(\frac{U_{it}}{\overline{U}_t} - 1)$ is a ratio of regional to national rate of unemployment. Normalization by the national rate serves two purposes. First, it controls for the national trend including the variations caused by the changes in measurement procedure. Second, it allows controlling for persistent long term differences in the natural rate of unemployment (Grey 2004) with region specific intercepts ($\delta_k D_k$). Subtraction of one forces this variable to have a zero-mean leading to an interpretation of the model parameters in terms of deviations from national averages.

The estimated coefficients on the regional dummies will indicate the relative natural unemployment rate in regions. Values of the dummies which are below zero indicate that such regions have a natural unemployment rate lower than the national average. Regions with high values of these coefficients should be the target of policies mitigating the natural rate (e.g. economic development policies).

A degree of structural unemployment is proxied with a restructuring index of regional employment (*R)*. The index is computed as a sum of absolute differences among the shares of employment by sector (*s*) between years *t* and *t'*, divided by two[1] (3). The index represents a share of employment that needs to be redistributed to get the original structure of regional economy.

$$R_{it} = \frac{1}{2} \sum_{s} |S_{it} - S_{i,t-t'}| \qquad (3)$$

The last group of variables in equation (2) is included as a measure of the demand-driven unemployment. The first term (ΔX) represents a change in total employment between years *t* and *t-1*, the second term is a lagged value of the employment change. ΔXn represents a change

[1] Division by two mitigates a double counting when an increase in share of one sector is necessarily offset by the same decrease in other sectors.

in total employment in the neighboring[2] regions and its lagged value. The number of lags included into the model and the functional form of the variables is determined based on the appropriate test and data availability as described in the results section.

The size and statistical significance of the model parameters may depend on the size of the unit of analysis. It is expected that the larger is the unit the smaller will be the effect of the shocks coming from the neighboring regions since larger units would closer approximate local labor markets within which most people live and work (Tolbert and Sizer 1996). Thus, appropriateness of inclusion of the spatial lags will also be tested.

The estimated model parameters indicate how the respective changes in regional labor markets translate into the deviation of regional unemployment rates from the national average. However, in order to use the estimation results to form policy recommendations, structural and demand-driven unemployment has to be computed from the model estimates as described in section five.

4. Data

The proposed decomposition approach is applied to describe the structure of unemployment in Ukraine in 2001-2005. The primary data comes from the State Statistics Committee of Ukraine (DerjComStat, annual yearbooks), regional statistics committees of Ukraine as well as regional employment centers[3].

The case of Ukraine is interesting for two reasons. First, transition from the centrally planned economy to a market system has been accompanied by significant changes in the labor market. Initial sharp decline in the GDP (from 111.6 billion USD in 1990 to 41.3 billion USD in 1998 according to Rudenko [2005]) has been accompanied by a large scale structural changes in the economy leading to a major reallocation of labor among regions, industries, and occupations. Second, the Ukrainian labor market has a modest level of regulation (e.g., the wages are fairly

[2] Common border is used as a proximity measure.
[3] The authors are thankful to the Kyiv School of Economics/ Kyiv Economic Institute Research Data Center for collecting, digitizing and cleaning the data used for this study.

flexible, firing costs are low, and unions are not active), while the overall level of development is comparable to other Eastern European countries (e.g., The Ukraine Competitiveness Report 2008; Doing Business 2010). Thus, it is reasonable to expect a flexible response of the market to various shocks and a high variation in unemployment that accompanies the structural changes. Unemployment statistics throughout the 1990s confirms such expectation. The rate of registered unemployment reaches around 4.3 percent of the working-age population by 1999 (see Figure I) and is decreasing through 2000s.

This paper measures the unemployment as a ratio of registered unemployed to the total working age population (males 16 to 60 years old; females 16 to 55 years old). Such measure is different from the standard ILO definition (percentage of unemployed in the labor force). However, the current study uses for analysis administrative units (city, rural district) and at this level the ILO defined measures of unemployment are not available in Ukraine. Despite the fact that the registered unemployment underestimates the actual number of unemployed, the correlation between the two measures is 0.80. For the comparison of both measures at the national level see Figure I.

Even though a relatively low rate of unemployment is registered in 2005 (3.3 %), a large variation is observed among the minor administrative units of Ukraine (cities and rural districts)[4] ranging from 0.3 percent to 15.3 percent (see Figure II and Table I). Unemployment rate has also been highly interdependent across the space. Spatial autocorrelation is equal to 0.63 in 2005, meaning that the rate is fairly similar across the neighboring administrative units (see Figure II) with higher unemployment in rural areas (5.3% vs. 1.8%). Commuting is the primary source of such interdependence. The areas with relatively high rates of unemployment are concentrated primarily in the central part of the country.

Dynamics of unemployment has also been different at the sub-regional level (Nizalov et al. 2007). For example, unemployment rate has increased by 7.7 percentage points for Izum city

[4] Ukraine has 27 major sub-national administrative units called oblast (region), and 668 minor or sub-regional administrative units called rayons (districts) and cities. There are also two cities (Kyiv and Sevastopol) that have a special administrative status (see Figure 3).

while it has decreased by as much as 10.6 percentage points for one of the rural districts in the Southern Ukraine during 2001-2005. Rural areas in the central part of the country experience the highest increase in the registered unemployment. The observed heterogeneity of the labor market provides sufficient grounds for applying the proposed decomposition method.

The study uses annual data on minor administrative units of Ukraine. There are 490 rural districts (rayons) and 176 cities in Ukraine in 2005 with an average population of 43 and 127 thousand people respectively. Since the unemployment statistics is reported at the level of local employment center service areas, in 62 cases this service areas include several administrative units (usually a city and an adjacent rural district). Thus, all statistics is aggregated up to 606 service areas. Also, there is one administrative unit (Prypiat' city – satellite city for Chornobyl nuclear station) that does not report in official statistics, leaving a sample of 605 observations in each year.

Table I presents the sample statistics for 2001 and 2005 for key variables used in the decomposition exercise. As one can see, the average unemployment rate (measured as a ratio to working age population) basically unchanged from year 2001 to 2005. However, the range of values remains very wide. Such variation in unemployment rates results from a decline in the average number of jobs (it decreased by 5.8% in 2001, and almost stopped in 2005) and a continuous redistribution of labor across the industrial sectors (captured by the restructuring index). About 5.3 percent of jobs have been redistributed among the industrial sectors in 2001, while 4.3 percent in 2005.

<Table I>

5. Decomposition results

The decomposition model is estimated using the OLS procedure adjusted for the correlation in error term within the major sub-national administrative units (oblast). The

preferred model contains a squared term of the restructuring index and one-year lags of the employment change. Nine different specifications are compared and the robustness of results is discussed at the end of this section. The main results of the regression-based decomposition are reported in Tables II and III. All of the coefficients have the expected signs[5]. For example, a larger change in local industry structure is associated with higher unemployment, while a higher job growth in the local labor market reduces it. However, the magnitude of the estimates does not have a direct interpretation. In order to interpret the results and to draw policy recommendations, Equation 2 for predicted values is rewritten in the following way:

$$\hat{U}_{it} = U_t\left(\sum_{k=1}^{N} \hat{\delta}_k D_k + \hat{\beta}_1 R_{it} + \hat{\beta}_2 R_{it}^2 + \hat{\beta}_3 \Delta X_{it} + \hat{\beta}_4 \Delta X_{it-1} + \hat{\beta}_5 \Delta Xn_{it} + \hat{\beta}_6 \Delta Xn_{it-1} + 1\right) \qquad (4)$$

And then:

$$\hat{U}_{it} = U_t \sum_{k=1}^{N} \hat{\delta}_k D_k + U_t \hat{\beta}_1 R_{it} + U_t \hat{\beta}_2 R_{it}^2 + U_t \hat{\beta}_3 \Delta X_{it} + U_t \hat{\beta}_4 \Delta X_{it-1} + U_t \hat{\beta}_5 \Delta Xn_{it} + U_t \hat{\beta}_6 \Delta Xn_{it-1} + U_t \qquad (5)$$

Regression-based decomposition provides values of parameters δ_i, β_1 - β_6 (reported in Table II). These values are multiplied by the corresponding values of variables for the administrative units and, according to Equation (5), by the national rate of unemployment. Equation (5) includes also an additive term for the national unemployment. Predicted values of each unemployment type are used for identifying the dominant type. The unemployment type that generates the largest positive deviation from the national average in a given location in a given year is considered as the dominant. The revealed types can be targeted with appropriate policy measures. An example is presented in Box 1.

<Table II>

[5] A positive sign on the job growth in neighboring area represents a net effect of two processes. First, new jobs in a neighboring region taken by residents of region *i* may reduce a local unemployment in region *i*. However, if the new jobs lead to a larger decrease in unemployment rate in the neighboring region (and also the national average), then this growth would have a positive effect on unemployment in the region *i* relative to the national average by construction of the dependent variable.

Box 1. Example of decomposition results

Vatutine-city (Cherkasy region) in 2005 has the restructuring index of 0.25, employment growth of 0.09 points with the lag of 0.02. The growth in the neighboring area is (-0.04) points with the lag of (-0.14). The predicted values are **2.74** percent for the deviation from the national average due to the local natural unemployment, **0.07** percent for the structural unemployment and (**-0.06%)** due to the demand-driven unemployment. A negative value means that the employment growth in the local labor market has decreased a local unemployment rate in comparison to the national average. The sum of these deviations is **2.75** percent. Addition of the national average unemployment rate for year 2005 (**3.2**%) results in the predicted rate of unemployment of **5.95** percent. The registered rate of unemployment in this city is **5.7** percent in 2005. As can be seen, local natural unemployment explains the major part of the deviation from national average. Thus, this area is identified as having the natural type and should be targeted with policies such as improvements in transportation and communication infrastructure, improving professional mobility and job matching. However, a specific policy recommendation could be developed based on in-depth analysis of the local economic environment.

The application of the proposed decomposition method shows that the natural unemployment is a dominant type for 330 minor administrative units of Ukraine in 2005, while demand-driven unemployment dominates in 208 units. Structural unemployment dominates in 67 cities and rural districts (see Figure V). As can be seen from Table III, the number of regions with the dominant natural type of unemployment is unchanged between 2001 and 2005. The number of regions with dominant structural unemployment has increased slightly while the number of regions with high demand-driven unemployment has decreased.

There are two processes that change the dominant type between the two years. First is a new short run shock to the labor demand. As a result, 10 regions that have dominant natural type

of unemployment in 2001 experience a relatively high demand-deficient unemployment in 2005. Similarly 40 administrative units that have dominant structural unemployment in 2001 switch to the demand-deficient type. Second process is an adjustment of the labor market to the shocks. In a short run, shocks cause a relatively high demand-deficient unemployment in 2001. However, in a longer run, they translate into structural changes in local industry mix accompanied with structural unemployment. Table III reports 50 cases of such transition. In addition, there are 10 cases where the effect of a short run shock disappeared by 2005 and unemployment returns to its natural rate. A stable number of regions with dominant natural unemployment may reflect a fact that the labor markets in Ukraine adjust to the shocks primarily through the labor demand side (industry composition), while mismatches on the supply side may persist in a long run (excessive labor does not migrate or changes its primary occupation type).

<Table III>

The presented result does not support Lilien's (1982) claim that restructuring is responsible for more than a half of variation in regional unemployment rates. The dominance of natural unemployment in Ukraine may reflect the fact that a transition to market economy is not over yet and local institutions and infrastructure for the efficient labor markets are yet to be developed.

The results show also large spatial differences in *natural unemployment* within Ukraine, measured in deviation from the national average (Figure VI). In 2005 it ranges from (-3.2%) in Zaporizkiy rayon (Zaporizkiy region) to 10.1% in Volovetski district (Trans-Carpathian region). The range is even wider in 2001 – from (-3.8%) to 11.9%. In 238 administrative units the values are below zero in 2005. These regions have local conditions that allow keeping the unemployment rate below the national average, holding the cyclical changes fixed. The number of administrative units with predicted values of natural unemployment above 5% is 49. Such regions should be targeted with policies that mitigate natural unemployment. A significant

difference in the values of natural unemployment is found between cities and rural districts. For example, in 2005, the average value of this type of unemployment is (-1.4%) in cities and 1.1 percent in rural districts. This type is considered as a dominant type in 63.3 percent of rural districts, while it dominates only in 33.1 percent of cities.

The rate of *structural unemployment* ranges from 0.01 percent in Slavutych city (Kyiv region) to 0.3 percent in Chechelnytski district (Vinnitsa region) in 2005. Figure VII illustrates this geographical distribution. The range of values is similar in 2001, which conforms the stability of adjustment processes. Structural unemployment is more typical for the labor markets of large cites and their adjacent rural areas (21.7% of cities vs. 6.7% of rural districts have this type as dominant in 2005) The lowest structural unemployment in Slavutych city (followed by the adjacent rural district) can be explained by the fact that this city is a satellite city for the Chernobyl nuclear station with highly regulated local economy.

The *demand-deficient unemployment* varies from (-0.5%) in Krasnodon-city (Lugansk region) to 1.2 percent in Sakskiy district in Crimea Republic (see Figure VIII). In 2001 the deviations from the national average caused by this type of unemployment ranged from (-1.0%) to 1.6 percent. The old industrial regions in Eastern Ukraine and rural areas in the central and Southern parts of the country, have the highest rates of this kind of unemployment in 2005. The areas with high positive structural or demand-deficient unemployment may be targeted with policies like job training and retraining, investment attraction programs or public works.

The usefulness of the presented decomposition method depends on robustness of the obtained results to changes in definitions and assumptions the method relies upon. Three types of robustness checks are performed. First, we check for stability of results over different periods of time and geographical scope of the analysis. The preferred model is re-estimated for 2001-2003 and 2003-2005 sub-samples as well as for sub-samples that include only Central, Eastern,

Western or Southern parts of Ukraine. Despite a lower statistical significance most estimated parameters preserve their sign and magnitude in each sub-sample[6].

Second, nine different model specifications are considered. These models include different number of time lags of the explanatory variables as well as their different functional forms. These lags are occasionally significant. However the results are less stable. Nevertheless, in 1,853 region-year observations out of 3,025 (61.3%) the defined dominant type remains the same across all the models.

Third, a more rigid definition of the dominant type is applied. 95% confidence interval is constructed for each predicted value of each type of unemployment. The source of variation is the variation in the estimated model parameters (all appropriate covariations are accounted for). Such check is required especially for the predicted values of the natural type of unemployment since they are predicted on vary small number of observations. According to the rigid definition, a type is considered as dominant if the lower bound for the predicted value is higher than the upper bound for other two types. The type is defined as "mixed" for observations that do not satisfy this rule (see Figure IX for the distribution of the unemployment types in 2005). According to this more rigid definition, 267 minor administrative units (60.7%) preserve their types in 2005 (see Table IV for more details). According to this test, the most robust results are for the natural type of unemployment. Only 45 observations (13.6%) switch to the mixed type. On the other hand, 55 units (82.1%) with dominant structural unemployment switch. Similar pattern is observed in other years. 1,195 observations out of 3,025 are defined as having the mixed type. However 951 (79.6%) of them are those observations that do not have a robust type across different model specifications mentioned above. Thus, we can conclude that the results that meet the 95% confidence interval test are robust to other changes in the decomposition model assumptions.

<Table IV>

[6] Results are available from authors upon request.

6. Conclusions

There is a wide range of unemployment rates across the regions of almost any country. In the case of Ukraine it ranges from 0.26 to 15.3 percent of working age population in 2005. A method presented in this paper allows decomposing the observed rates of unemployment into natural, structural and demand-deficient components.

The dominant type of unemployment for the majority of the areas in Ukraine is the natural unemployment. However, there are significant differences in the rate of natural unemployment within Ukraine. Structural unemployment is the primary type for 67 administrative units, while the demand-deficient unemployment dominates in 208 cities and rural districts in 2005. The main results are robust to changes in the model specification and are stable over time and across regions.

The revealed differences in dominant types of unemployment suggest that state policy to mitigate unemployment should vary from region to region to properly address the causes of unemployment in the local labor markets. Thus, the obtained results may improve targeting of economic development efforts. According to Taylor (1996), reducing regional unemployment disparities will lead to higher national output and lower inflationary pressure. Furthermore, reducing these disparities produces substantial social benefits.

The proposed methodological approach is applicable for analysis of regional unemployment in other transition and developed countries with geographically diverse labor markets.

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TABLES

Table I. Summary Statistics

Variable	Year	Mean	Std. Dev.	Min	Max
Unemployment rate	**2001**	0.037	0.026	0.004	0.189
(ratio to working-age population)	**2005**	0.033	0.028	0.003	0.153
Employment growth	**2001**	-0.058	0.059	-0.481	0.140
(ratio to the total number of jobs)	**2005**	-0.001	0.051	-0.333	0.190
Restructuring index	**2001**	0.053	0.047	0.002	0.331
(ratio to the total number of jobs)	**2005**	0.043	0.034	0.002	0.285

Note: statistics for 605 annual observations; population weighted

Table II. Regression Results

Variable	Coef.	Std. Err.
Restructuring index (β_1)	0.937	(0.366)**
Restructuring index squared (β_2)	-2.729	(1.296)**
Annual employment growth (β_3)	-0.584	(0.196)***
One year lag of annual employment growth (β_4)	-1.037	(0.294)***
Annual employment growth in adjacent area (β_5)	0.590	(0.305)*
One year lag of annual employment growth in adjacent area (β_6)	-0.593	(0.233)**
Number of observations	3025	
R-squared	0.90	

Note: Population weighted; the individual intercepts are not reported; cluster robust standard errors are reported; * significant at 10%; ** significant at 5%; *** significant at 1%

Table III. Dominant Types of Unemployment, Number of Minor Administrative Units

	2005			
2001	Natural	Structural	Demand-deficient	Total in 2001:
Natural	320	0	10	330
Structural	0	17	40	57
Demand-deficient	10	50	158	218
Total in 2005:	330	67	208	605

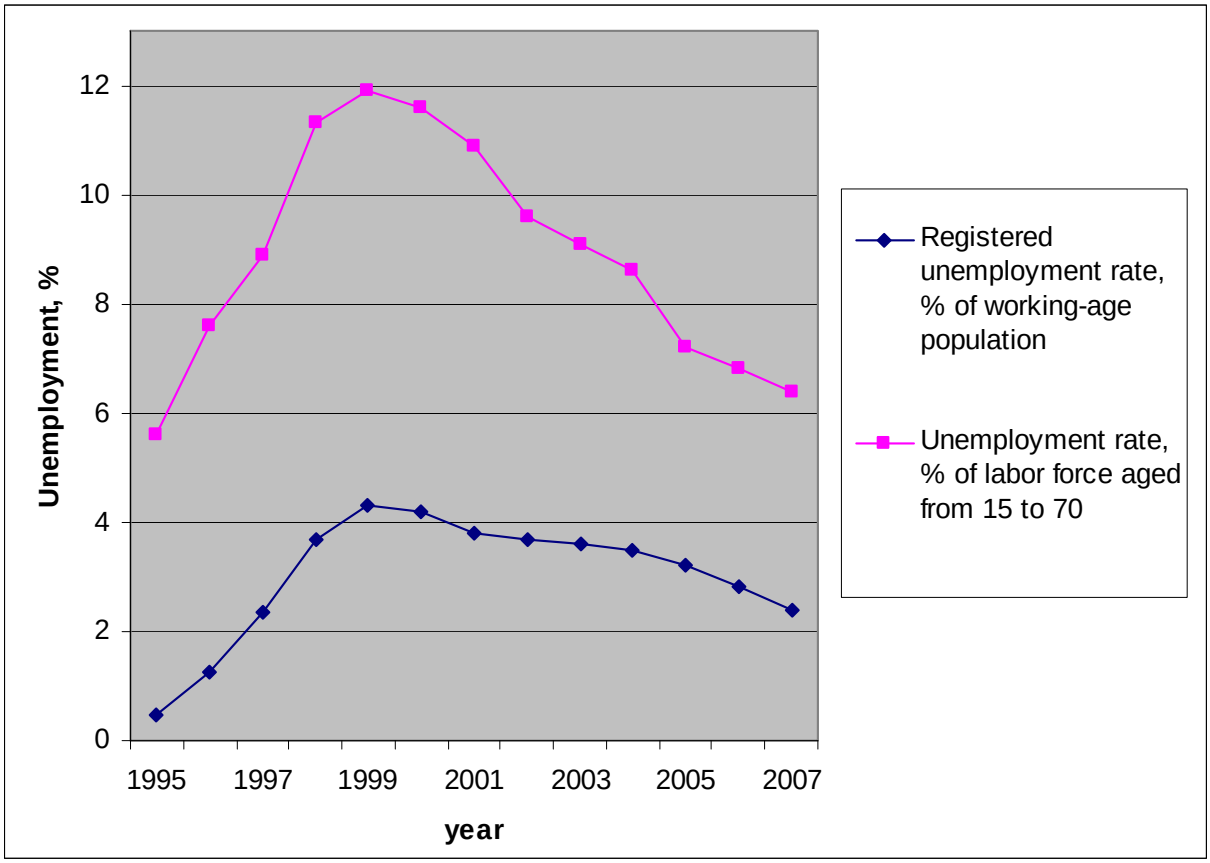
Table IV. Robustness to Definition of Dominant Types, 2005

	Rigid Definition	Standard Definition
Natural	285 (47.1%)	330 (54.6%)
Structural	12 (2.0%)	67 (11.1%)
Demand-deficient	70 (11.6%)	208 (34.4%)
Mixed	238 (39.3%)	N/A
Total	605	605

Note: Percent of total in parenthesis

FIGURES

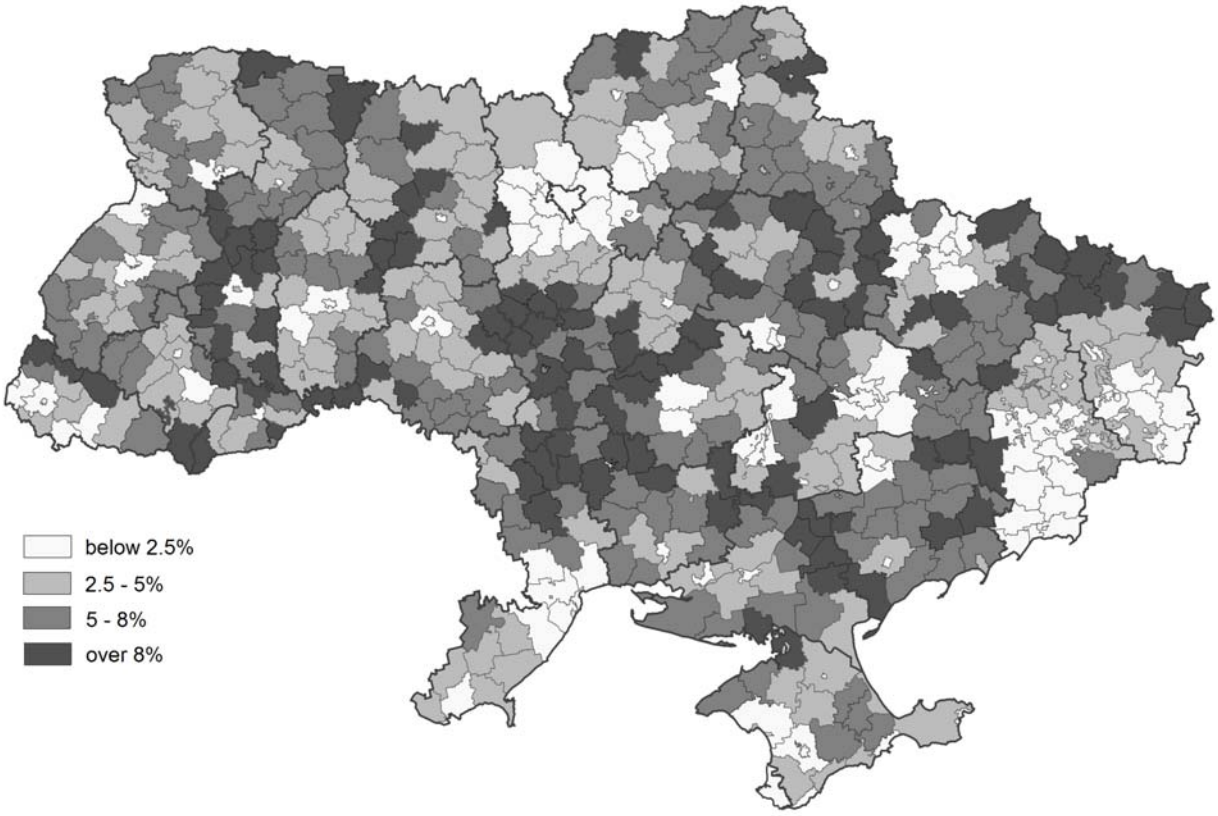
Figure I



Source: Derzhkomstat (Ukraine's State Committee of Statistics).

Changes in unemployment rate, Ukraine

Figure II

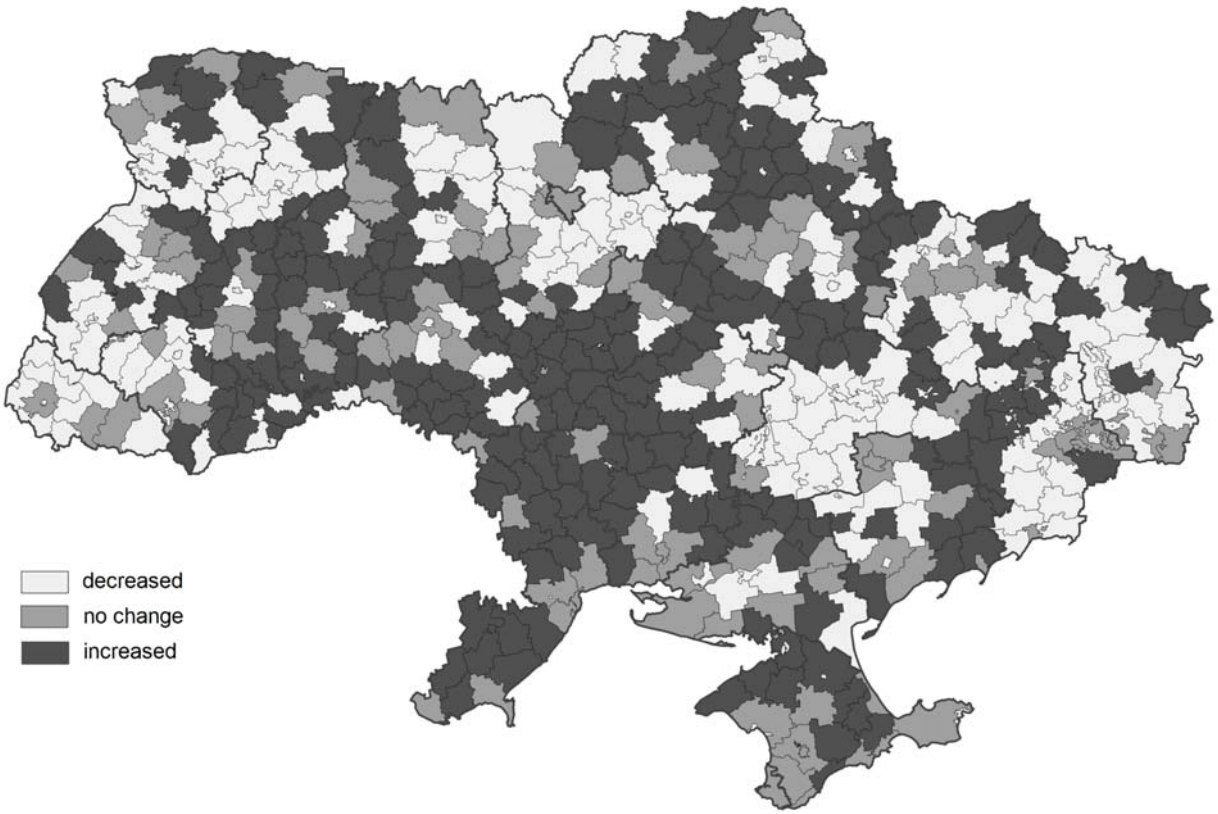


Registered unemployment rate, Ukraine, 2005

Figure III

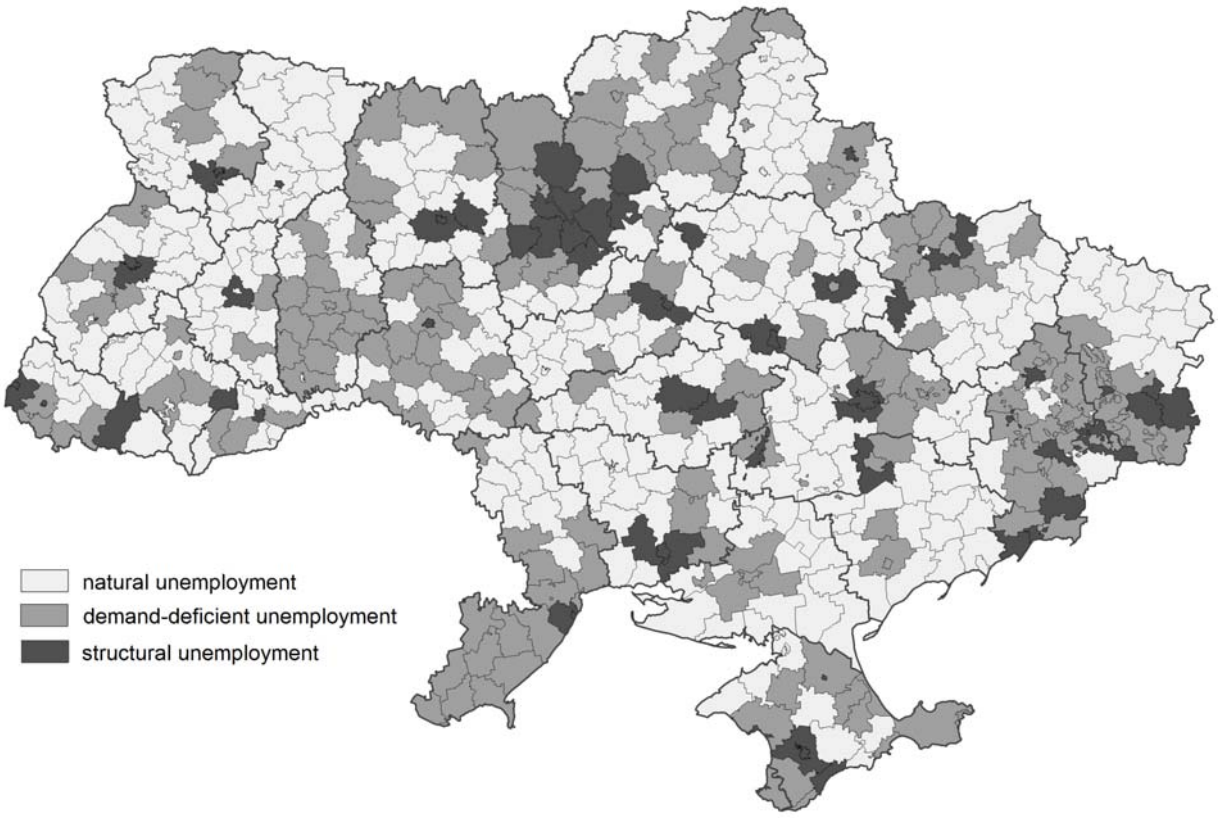
Administrative structure of Ukraine, 2005

Figure IV



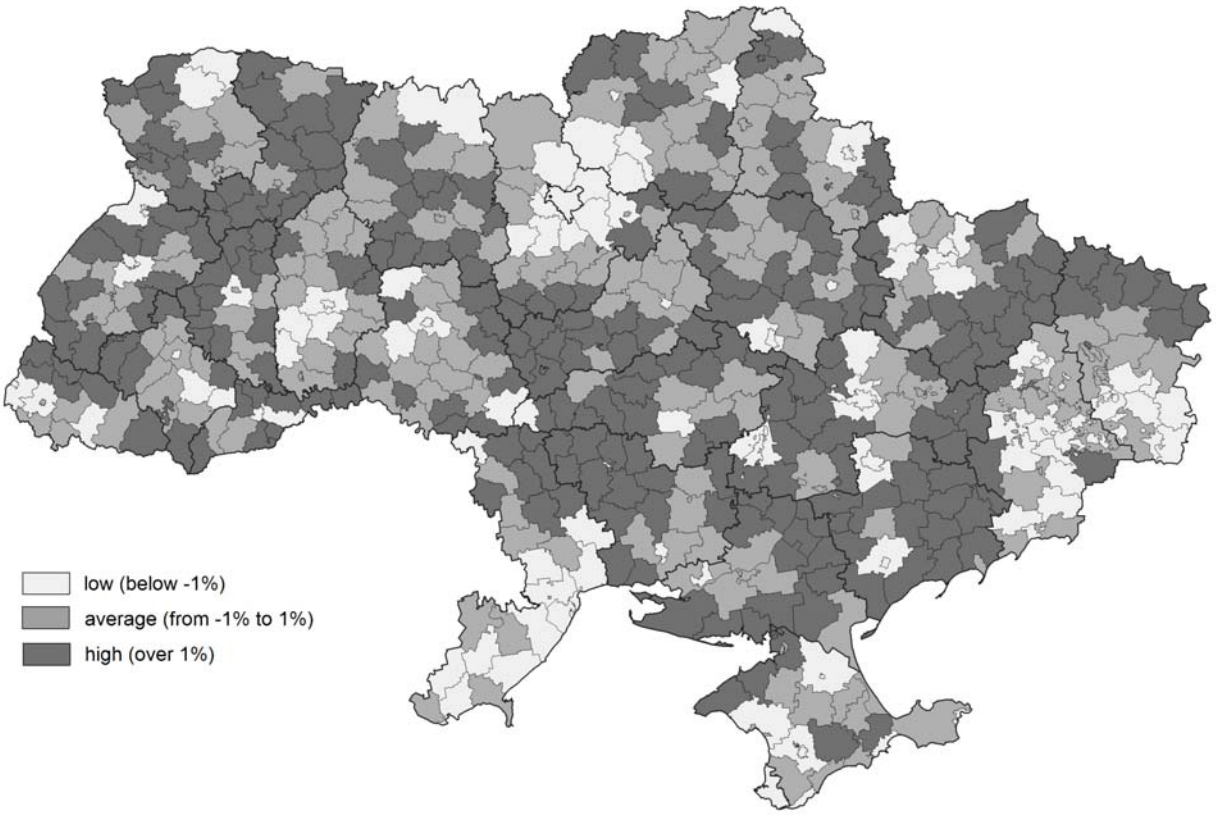
Change in registered unemployment rate, 2001-2005

Figure V



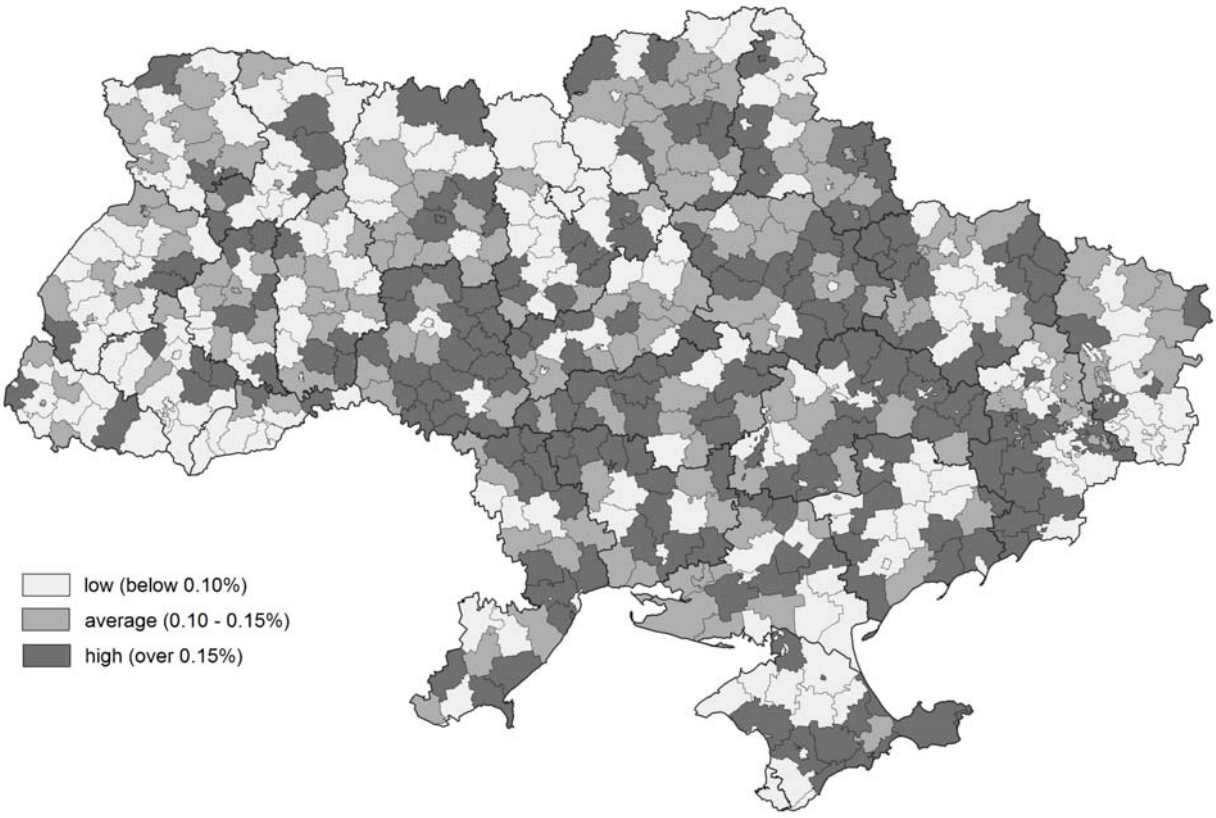
Distribution of dominant types of unemployment, 2005

Figure VI



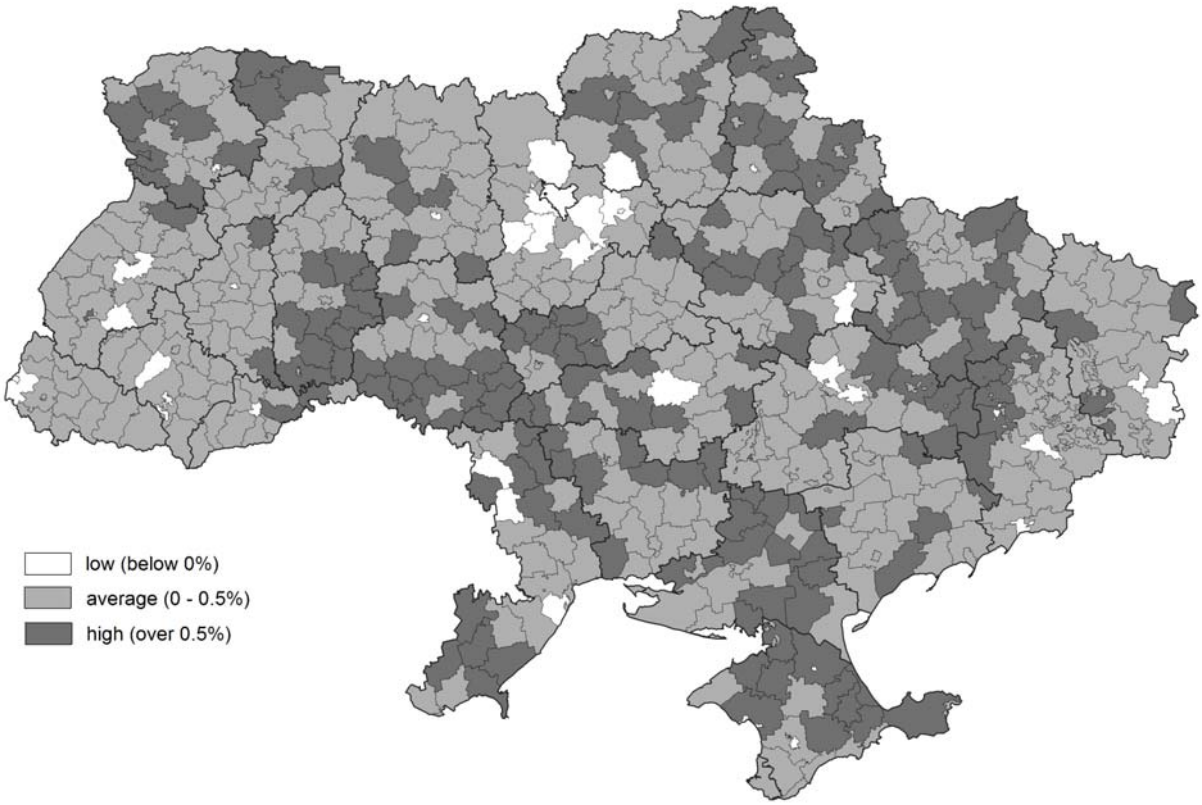
Distribution of natural unemployment rates, 2005

Figure VII



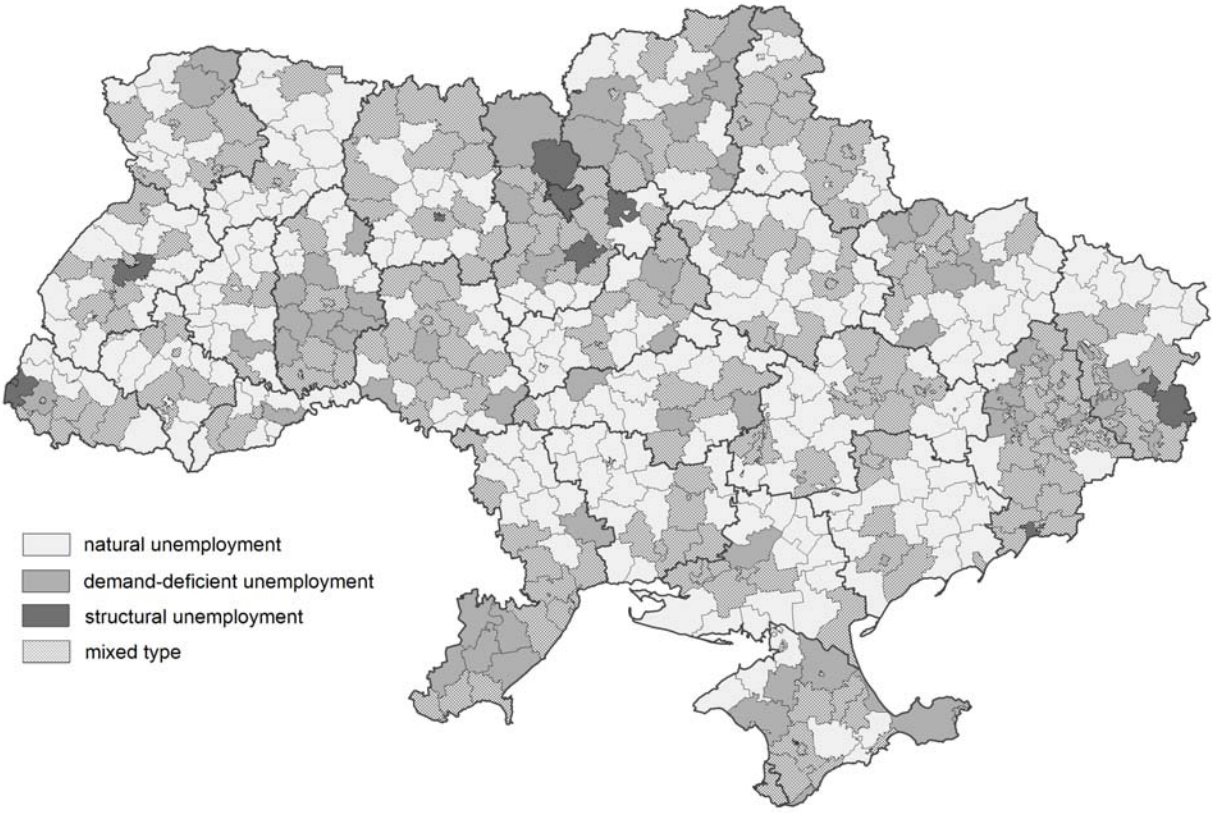
Distribution of structural unemployment, 2005

Figure VIII



Distribution of demand-deficient unemployment, 2005

Figure IX



Distribution of dominant types of unemployment that satisfy 95% confidence interval, 2005