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A note on the morphology of regional unemployment in Greece

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Abstract

A variation of an Error-Correction-Model is applied across the regions of Greece to examine the behaviour of regional unemployment. Allowing for multiple equilibria, this variation is able to pinpoint regional groupings with similar tendencies in the evolution of unemployment. The results have important implications for the direction of regional policies in Greece.

The findings, interpretations and conclusions are those entirely of the authors and do not necessarily represent the official position, policies or views of the Ministry of Rural Development and Foods and/or the Greek Government. All remaining errors are our own.
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1. Introduction

Do rates of unemployment converge across regions? If so, does this occur uniformly or is a distinctive property of a certain group? Such questions have generated a considerable amount of empirical literature (e.g. Martin, 1997; Baddeley *et al*., 1998), developed in conjunction with the debate on regional income convergence (e.g. Baumol, 1986; Carlino and Mills, 1993; Lopez-Rodriguez and Faiña, 2009). The purpose of this note is to add to the existing literature by testing for convergence in unemployment rates with reference to the NUTS-2 regions of Greece. While there are some studies on regional income convergence in Greece (e.g. Siriopoulos and Asteriou, 1998; Alexiadis and Tomkins, 2004), nevertheless, countries such as Greece have rarely received attention as testing grounds for the hypothesis of regional convergence in terms of unemployment. Consequently, empirical evidence on this context is still very scarce. This note aims to shed some further light on this issue by considering an Error-Correction-Model (ECM), modified appropriately to encapsulate the interesting aspect of convergence 'in groups'.

Given the present fiscal crisis in Greece, the issue of regional unemployment has become, more than ever, of fundamental importance. It seems that the past, and the current, regional policies in Greece, have resulted very few in terms of combating regional unemployment. This can be attributed, partly, to rigidities in the underlying economic system of Greece. In this context, a critical question arises: is there an alternative solution to the problem of regional unemployment in Greece?

We will attempt to form an answer to this question within the four sections of this note. The framework, upon which the empirical analysis will be conducted, is outlined in Section 2. In Section 3 some points about the methods employed and the data used in the process of econometric estimations are discussed, followed by the presentation and a detailed account of the obtained results. Finally, some implications of our specification are drawn in Section 4.

2. Model Specification

A first problem a researcher is confronted with is choosing an appropriate framework for examining the prevailing tendencies in regional unemployment. An answer to the aforementioned issue, despite the plethora of alternative approaches[1], is offered by Martin's (1997) seminal work. An ECM is implemented, accordingly, which integrates the process of adjustment towards steady-state equilibrium. The structure of this model enables to determine the time required for a region to reach steady-state equilibrium, through the error-correction term. Embedded in this structure of thought is that steady-state equilibrium is identical to the national level of unemployment. However, such perspective implicitly assumes that regional unemployment rates are evenly distributed around equilibrium (i.e. the average/national level of unemployment). Nevertheless, there is a distinct possibility: diverging regions in terms of national unemployment, to exhibit converging tendencies towards an alternative steady-state. Expressing the notion of steady-state equilibrium at the national level is unlikely to account for this *heterogeneity* across space. Thus, an alternative proxy is required. This might be defined with reference to Extended Geographical Areas (EGA), which implies multiple equilibria due to differences in regional endowments (e.g. population, natural resources, geographical location, etc).

[1] It is not difficult to document relevant studies. See for example Thirlwall (1966), Brechling (1967), Schofield (1974), among others.

This perspective provides a more realistic framework for the way in which we view regions and their economies[2].

This idea seems highly intuitive. Regional policy-making often requires decisions on a predetermined stage, which coincides with arbitrary defined administrative areas. In this case an *ex-ante* determination of the equilibria towards which regions move in the long-run, seems to be more appropriate. In the present context, an ECM that takes into account this consideration can be defined as follows:

$$\Delta u_{it} = a_{i0} + a_{i1}\Delta u_{LURE_t} + \theta_i[u_{i_{t-1}} - (\hat{\beta}_{i0} + \hat{\beta}_{i1}u_{LURE_{t-1}})] + \varepsilon_{it} \quad (1)$$

where i denotes a given NUTS-2 region, u is the rate of unemployment and ε_{it} is a random residual series with the usual properties (zero mean, constant variance and independently, identically distributed over time).

The difference $u_{i_{t-1}} - (\hat{\beta}_{i0} + \hat{\beta}_{i1}u_{LURE_{t-1}})$ is the residuals, lagged by one period, obtained from estimating the co-integrating relation: $u_{it} = \beta_{i0} + \beta_{i1}u_{LURE_t}$.

In equation (1) the subscript $LURE$ stands for the NUTS-2 region with the Lowest Unemployment in an EGA, which in the present context is identified with the NUTS-1 level. In choosing the appropriate $LURE$ in each NUTS-1 region, the average intertemporal unemployment was utilised. Thus, a NUTS-1 region is chosen for $LURE$ if the following criterion is satisfied: $\min\{\bar{u}_i \mid i \in j\}$, where $\bar{u}_i = \dfrac{\sum_{t=1}^{m} u_{it}}{m}$ with j denoting each NUTS-1 region of Greece ($j = 1,\ldots,4$) and m is the number of years included in the empirical analysis. In equation (1), the term inside the brackets includes the lagged of order one residuals of the co-integrating (long-run) relation between unemployment in each NUTS-2 region of Greece[3] and the corresponding $LURE$ (Crete, Ionian Islands and Thessaly). The extent to which the gap between the rate of unemployment in a NUTS-2 region and the relevant $LURE$ in one period is corrected during the next period, namely the adjustment rate, is measured by θ_i.

3. Empirical Results

The dataset refers to the unemployment rate for the 13 NUTS-2 regions of Greece over the period 1988-2009. The property of cointegration, together with a significant θ_i, is satisfied only for four NUTS-2 regions, shown on Table I[4].

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[2] This case receives considerable attention in the recent literature. For example, Gray (2005) implements an ECM to identify 'super-regions', which create spillovers to the remaining regions.

[3] The regional groupings, NUTS-1 and NUTS-2, used are those delineated by the Greek Statistical Agency. The NUTS-1 regions of Greece together with their corresponding NUTS-2 regions are the following: Attiki (Attiki), Aegean Islands (North Aegean, South Aegean and Crete), Central Greece (Hepiros, Ionian Islands, Peloponnese, West Greece and Sterea Ellada) and North Greece (Central Macedonia, West Macedonia, East Macedonia-Thrace and Thessaly). Due to the administrative structure of Greece, Attiki appears in both NUTS-1 and NUTS-2 classification. This overlapping feature has led us to exclude this region from the set of $LUREs$. The data used in the empirical analysis were obtained by the National Statistical Agency of Greece (Regional Accounts).

[4] The respective results for the remaining regions can be obtained from the authors upon request. It is worthy of note that testing for convergence amongst the $LUREs$ suggests that Attiki, the region with the highest average rate of unemployment among the $LUREs$ (about 10%), is in fact an outlier. Beyond reasons related to the classification system of the Greek regions, the aforementioned result provides further justification for excluding that region from the set of $LUREs$.

Table I: ECM, Greek Regions 1988-2009

NUTS 1 Region: Central Greece	ADF test	β_{i0}	β_{i1}	θ_i	a_{i1}	95% Bootstrap confidence interval for test H_0: $\theta_i = 0$
LURE: Ionian Islands						
Hepiros	-3.118**	5.671***	0.622***	-0.492**	0.071	[-2.249, 2.056]
	[0]	(1.383)	(0.191)	(0.210)	(0.302)	
Peloponnese	-3.745**	5.623***	0.268***	-0.662***	0.049	[-1.919, 2.263]
	[0]	(0.478)	(0.066)	(0.225)	(0.111)	
West Greece	-3.500**	8.394***	0.202*	-0.630**	0.008	[-2.196, 2.327]
	[0]	(0.746)	(0.103)	(0.224)	(0.174)	
NUTS 1 Region: Aegean Islands	ADF test	β_{i0}	β_{i1}	θ_i	a_{i1}	95% Bootstrap confidence interval for test H_0: $\theta_i = 0$
LURE: Crete						
South Aegean	-2.815*	-0.346	1.528***	-0.655***	1.009***	[-2.057, 2.135]
	[0]	(1.381)	(0.253)	(0.201)	(0.292)	

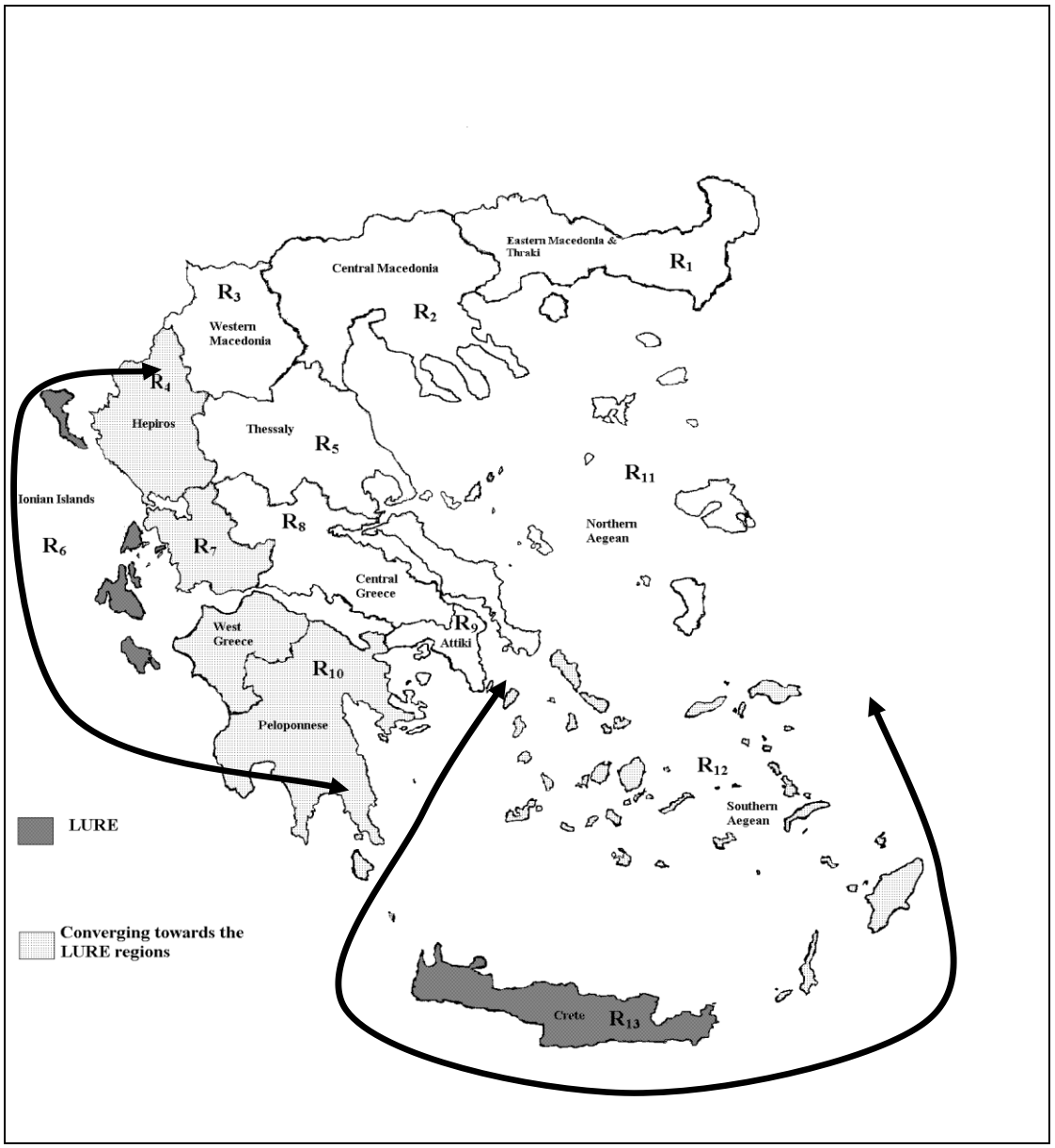
Notes: Figures in parentheses are standard errors, ***, **, * denote significance at 1%, 5% and 10%, respectively. The ADF test examines the property of cointegration between a NUTS-2 region and its respective *LURE*, by determining the order of integration of the residuals derived from the regression of the aforementioned time-series (see Engle and Granger, 1987). In the ADF test equation only constant is included. The maximum lag length in ADF test is determined using the Akaike information criterion. The number of lag lengths is in brackets. The bootstrap confidence intervals were determined through residual bootstrapping (1,000 replications).

Quantitatively, the most important effect is that according to the estimated values of θ_i, the time-span required for any divergence between a region's unemployment rate and that of the respective *LURE* to vanish varies from 6 (Hepiros) to 4.5 years (Peloponnese). Attention should be drawn to the fact that Hepiros exhibits the slowest rate of movement towards its steady-state equilibrium, irrespective of the geographical proximity with its *LURE* (Figure 1). On the other hand, Peloponnese, a region located in relatively greater distance from the *LURE* converges in a faster rate.

It is worth to note that Hepiros is amongst the poorest regions in the EU (Boldrin and Canova, 2001). The robustness of the significance of θ_i is tested further by implementing a 'bootstrapping' technique. The idea behind this technique is to use the estimation residuals to artificially generate additional observations, which have the same distribution as the original observations, through a Monte-Carlo type process. Using the additional observations, a more robust estimation can be obtained[5].

[5] See Greene (1997) for further details.

Figure 1: The Morphology of Regional Unemployment in Greece



According to the associated confidence intervals, reported in the last column of Table I, the alternative hypothesis of $H_1 : \theta_i \neq 0$ is accepted at 5% level of significance in all cases. The robustness of the produced results is also confirmed by a set of diagnostic tests, with the relevant statistics reported in Table II.

Table II: Diagnostic tests

	JB	Reset test	LM_1/LM_2 test
Hepiros – Ionian Islands	9.152	0.555	1.022/0.500
	[0.0103]	[0.4664]	[0.3261/0.6157]
Peloponnese – Ionian Islands	6.590	0.543	0.061/0.196
	[0.0371]	[0.4712]	[0.8084/0.8235]
West Greece – Ionian Islands	4.135	0.120	0.297/0.297
	[0.1265]	[0.7332]	[0.5927/0.7470]
South Aegean – Crete	0.221	0.250	0.046/0.056
	[0.8953]	[0.6232]	[0.8324/0.9460]

Notes: The above Table reports the values of the corresponding test statistics. Figures in brackets represent asymptotic *P* – values associated with the tests. *JB* denotes the Jarque-Bera normality test of errors. The Reset test tests the null hypothesis of no functional form misspecification. LM_1/LM_2 is the Lagrange multiplier test for first and second order serial correlation (under the null there is no serial correlation in the residuals up to the specified order).

The Reset Test indicates no specification problems, enhancing the appropriateness of an ECM model in examining trends in regional unemployment. This argument receives additional support by the *LM* tests for serial correlation; a problem frequently emerged in time-series models. Accordingly, the residuals obtained from equation (1) are regressed against the regressors of equation (1) plus the sum of the lagged residuals up to order s (where s denotes the order of serial correlation we want to test)[6]. The associated null hypothesis for this test is $H_0 : \gamma_{i1} = \gamma_{i2} = \ldots = \gamma_{is} \neq 0$, where γ is the coefficient of the respective lagged residuals. The error terms of equation (1) are normally distributed in most cases according to the JB tests. On the other hand, the associated hypothesis is marginally accepted in the case of a relatively slow converging region (Hepiros).

The converging regions cover the south and the west part of the country, as shown in Figure 1, which suggests that the geographical location is a factor that accounts for the convergence pattern that a region follows. Intuitively, this can be taken as evidence of spillover effects amongst regions. The source of these spillovers can be found, possibly, to links amongst a region and its respective *LURE* . These can take several forms, such as cultural, historical and, especially, economical. For example, the main (exporting) activity in a region can generate spillovers to the surrounding regions. In the present case, according to regional accounts, published by the National Statistical Agency of Greece, tourism constitutes one of the main activities in the two *LUREs* (Ionian Islands and Crete). Bearing this in mind, the convergence pattern, implied by the empirical results, does not seem to be randomly distributed. The region of South Aegean relies heavily on the tourism industry while in the regions of West Greece the port of Patras, one of the main ports in Greece, is located; a port which accounts for substantial flows in tourism (and commerce) from Italy. Following the discussion above, the convergence behaviour of Hepiros and Peloponnese, probably, can be attributed to a shift towards the provision of services related to tourism. Based on this, it might be argued that in high unemployment regions, the tourism industry is, possibly, able to absorb the excess labour force. Indeed, as Rietveld and Shefer (1999) aptly point out that there is a tendency for underdeveloped regions, usually associated with high unemployment, to become attractive tourism destinations. However, this view does not take into account the

[6] In the present case $s = 1,2$.

possibility that endowments in those regions might not allow for such an effect to take place. Nevertheless, these arguments are highly intuitive and considerably more research is required before the relation between tourism and regional unemployment in Greece can be discussed with some confidence. Such research should try to answer a series of critical questions concerning, for example, the appropriate ways to approximate spillovers in the ambit of a single model, the ability of tourism to produce positive spillovers and its links with the remaining sectors in a region. This clearly implies the need for more detailed and focused analysis. Nevertheless, such considerations go beyond the aims of this small note. We reserve the right however, to return to those issues as part of an ongoing research programme regarding regional unemployment in Greece, undertaken by the authors.

4. Conclusion

In the case of Greece and although an increasing number of regional studies have paid attention to issues of regional income convergence, the empirical assessment of regional unemployment convergence has not so far received the due attention. However, policy makers need independent and encompassing studies like this, which can provide critical new information about the tendencies in regional unemployment.

Deploying an already established apparatus for examining tendencies in regional unemployment, this note provides an alternative view. In particular, steady-state equilibrium is approximated in terms of the spatial unit with the lowest unemployment. Taking this as the main vehicle of analysis, the empirical application has produced a convincing view of the prevailing situation in Greece, in conjunction with an interesting conclusion. To be more specific, the development of tourism industry, through its ability to create spillovers across regions, is a promising solution to a series of economic problems in Greece, such as unemployment and regional imbalances. In spite of the preliminary character of the analysis undertaken in this note, some, intuitive, policy implications can be afforded. Regional policies should be (re)oriented in expanding the tourism sector in regions with high unemployment. This expansion should aim to new markets, the provision of qualitative tourist services and the exploitation of the advantages stemming from the geographical location of a region. Obviously, there are several intriguing questions remained unanswered, mainly about the nature of convergence in regional unemployment and the effects of regional policy, such as building of an appropriate infrastructure. Nevertheless, the ECM specification utilised here, provides a promising point of departure in a thorough assessment of the tendencies in regional unemployment.

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