Beyond Rising Unemployment: Unemployment Risk, Crisis and Regional Adjustments in Greece

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ABSTRACT

The remarkable rise in unemployment in Greece has in a way overshadowed the substantial differentiation, across regions, in terms of regional unemployment and labour market adjustment. This paper examines the geography of these dynamics using probit regressions of unemployment risk and decomposing the observed regional unemployment differentials into three components corresponding to differences in labour quality, matching efficiency and effective demand. We find that, underlying the general increase in unemployment is a wealth of unemployment dynamics and adjustment trajectories. The fall in effective demand has been largest in the main metropolitan regions and the north and north-western periphery. Adjustment has been strong in some areas (e.g., Athens) but, overall, adjustment processes (such as bumping-down and changes in the mix of workforce characteristics) have been weak. The crisis has nullified the improvements in labour market performance registered since the country's entry into the Eurozone, hitting especially those regions that benefitted most from the latter. The spatial differentiation of adjustment intensities and demand pressures suggests a heightened role for regional policy in the post-crisis period, especially in relation to addressing problems of over-education and matching efficiency in the demand-depressed areas and of inter-regional adjustment mechanisms nationally.

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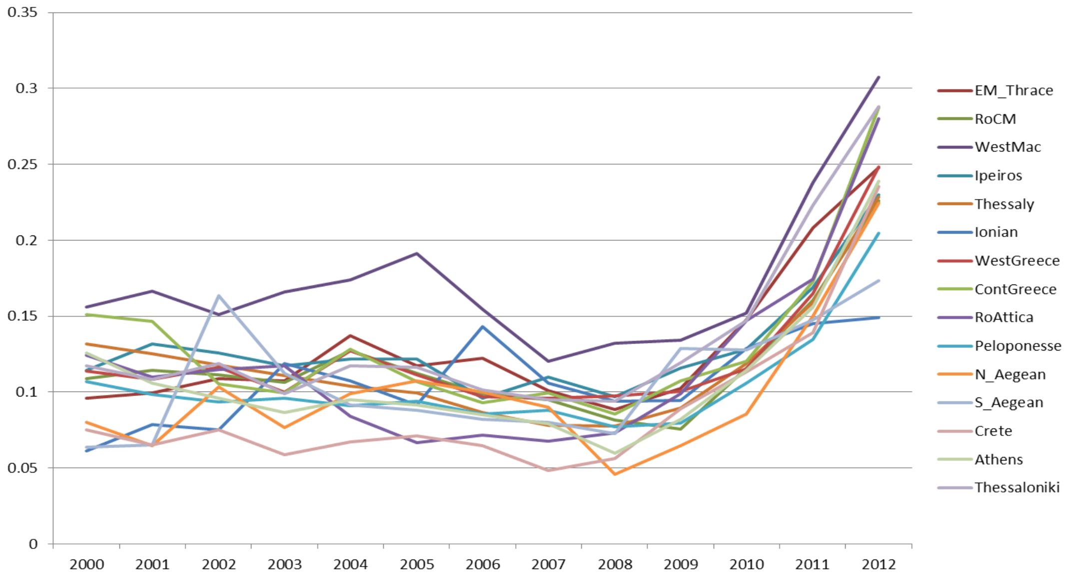
1. Introduction

As is well documented, unemployment in Greece has increased immensely during the last four years, reaching over 27% by early 2013. In many respects this increase has been universal, affecting all regions in a broadly similar fashion, as the shock that instigated it (the Greek fiscal crisis) was exogenous to the regions and seemingly symmetric (for evidence against this, see Monastiriotis, 2011). At a closer inspection, however, some notable heterogeneity emerges with regard to regional unemployment evolutions (see Fig.1). In 2012, unemployment rates ranged between less than 15% in the Ionian and over 30% in Western Macedonia. Moreover, between 2008 and 2012 unemployment rates increased by a 'low' 140% (or less) in the regions of Ipeiros, Ionian, Western Macedonia and South Aegean; but by multiples of this (over 300%) in Crete, Athens and the North Aegean. Curiously, membership into these groups is not easy to interpret. For example, the 'low-rise' group includes the region with the highest unemployment rate in the country (Western Macedonia), both historically and in 2012, as well as two regions that have had historically among the lowest unemployment rates nationally (Ionian and South Aegean). Similarly, the 'high-rise' group includes a large metropolitan area (Athens), a less dense but touristically developed region (Crete), and a rather underdeveloped region of remote and unconnected islands (North Aegean).

Figure 1. Evolution of regional unemployment in Greece, 2000-2012



Source: Greek Labour Force Survey (various years); authors' manipulations. Data used with permission from the Hellenic Statistical Authority.

To some extent at least, this variation must be reflective of the 'multiple heterogeneity' that characterises the Greek economic space (Monastiriotis, 2009 – see also Petrakos and Psycharis, 2004) – resulting in this case in some notable differences in types/intensities of labour market adjustment across the Greek regions, albeit around a common national path of fast rising unemployment. Partly motivated by this heterogeneity, in this paper we go beyond the descriptive analysis of patterns of unemployment and unemployment change, as depicted in Figure 1, and examine instead how regional unemployment differentials, and their changes, relate to regional differences in underlying unemployment risk and related demand and supply pressures.

To perform this analysis, we adopt a micro-econometric approach and look at the incidence and determinants of unemployment risk across the Greek regions[1] using probit regressions on individual-level data derived from the Greek Labour Force Survey covering the period 2000-2012. Following Lopez-Bazo and Motellon (2013)[2] we further apply an unemployment-risk decomposition analysis across groups of regions of different structural, economic and locational characteristics for periods before and during the crisis, in order to examine how different types of regional labour markets have responded to the crisis.

Examining unemployment risk in this way allows us to identify a number of distinctive influences exerted on the regional labour markets of Greece, which may be hard to unveil in an aggregate-level analysis.[3] First, using the regional fixed-effects from the probit regressions, we derive a measure of unemployment that is net of personal characteristics and of the unemployment risk assigned to each of these individually (expressed in terms of a 'baseline' worker profile that is common in all regions and years). We interpret this as a measure of *effective demand*[4] for each regional labour market – and variations in this as a measure of the relative intensity of the *demand shock* experienced by each regional labour market under the crisis. We also derive a measure of relative demand through our decomposition

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[1] We use the 15 statistical regions reported in the Greek LFS comprising the 13 NUTS2 regions, with the metropolitan areas of Athens (part of the NUTS2 region of Attiki) and Thessaloniki (part of Central Macedonia) reported separately.

[2] For an earlier implementation of the decomposition approach, examining differences across ethnic groups, see Blackaby et al (1999).

[3] Elhorst (2003) discusses the limitations of aggregate-level analyses of unemployment in the absence of good-quality regional data and 'perfect knowledge' about the correct model describing intra- and inter-regional labour market dynamics.

[4] Evidently, this measure is imperfect as it is not independent of our choice of reference categories in the probit regressions – although the use of a fixed reference category over time and across space makes it appropriate for cross-regional and temporal comparisons.

analysis (for groups of regions), by separating the measured impact of the regional fixed effects from that of the individual characteristics, as is described in the next section. By doing this, we are able to identify, second, the extent of unemployment which is due to relative *valuation* problems, i.e., to regional/group differences in the extent to which various individual characteristics are rewarded or penalised (in terms of employment probabilities). Evidence on valuation differences, reflecting essentially differences across regions in the demand for specific workforce characteristics, is also obtained directly from the estimated coefficients of our probit regressions (for each region – section 3). Third, again drawing on the decomposition analysis, we identify the part of unemployment that is due to *labour-quality* problems, i.e., the extent to which the available mix of individual characteristics contributes to aggregate unemployment (relative to some reference region).

Identifying these components is important, as it helps shed some light on processes of labour market adjustment – relating for example to the efficiency by which different regional labour markets match available workforce skills to jobs (labour market or *matching efficiency*) or the extent to which the crisis has intensified processes of *job-competition* (whereby individuals with more 'marketable' skills bump-down individuals with less competitive characteristics – Thurow, 1975). Despite the increased attention on the Greek economy since the eruption of the debt crisis, research on these issues in Greece is rather limited.[5] In that sense, our approach in this paper helps fill a gap in our

[5] See for example Christopoulos (2004), Livanos (2010a), Bakas and Papapetrou (2012), Cholezas et al (2012), Koutentakis (2012), Daouli et al (2013).

understanding of the prevalence of such processes in the Greek economy.

The remainder of the paper is structured as follows. In the next section we describe our micro-econometric approach and the decomposition technique used to derive the distinct components of unemployment. Section 3 presents the results from our analysis of unemployment risk across the Greek regions, focusing in particular on the spatial differentiation in terms of unemployment risk for specific individual characteristics (age, gender, education, etc). In section 4 we shift our focus to the macro-geographies of unemployment in Greece and examine, through our decomposition analysis, the direction of relative labour market adjustments across different regional groupings. Section 5 concludes with some implications for policy, particularly on the scope and priorities of (future) regional policy in Greece.

2. Data and method

As mentioned previously, our approach departs from the analysis of aggregate unemployment and seeks to investigate the dynamics of regional unemployment with the use of individual-level data within the context of unemployment-risk probit regressions. The essence of this approach is similar to that applied widely in the wage-equations literature[6]: in our case, *unemployment status* is determined by an unobserved latent variable (of a continuously-distributed underlying *unemployment risk*), which is in turn dependent on a set of personal

[6] See Heckman et al (2006) for a review of the so-called Mincer wage equation model.

characteristics (plus an area fixed-effect, capturing the overall market conditions in each regional labour market). Formally,

$$U_i^* = X_i b + \varepsilon_i \tag{1}$$

where U_i^* is the unobserved (latent) variable measuring the unemployment risk of individual *i*, X_i is a vector of personal and other characteristics of that individual, b is a vector of parameters measuring the contribution of each individual characteristic to unemployment risk and ε_i is a normally distributed person-specific disturbance. The observed unemployment status *U* is linked to this latent variable by the following condition:

$$U = \begin{cases} 1 \; if \; U^* > 0 \\ 0 \; otherwise \end{cases} \tag{2}$$

Under these conditions, the probability of observing *U=1* (i.e., someone being unemployed) is equal to the standard normal cumulative distribution for Xb and thus the parameter b can be estimated by means of a probit regression as

$$\Phi^{-1}(U) = Xb + \varepsilon \tag{3}$$

where Φ^{-1} is the inverse of the standard normal cumulative distribution.

This is a model that has been used widely in the literature to examine various issues concerning the incidence and determinants of unemployment, including the contribution to unemployment of various individual (education – Ashenfelter and Ham, 1979) and family characteristics (family size – McGregor, 1978); the impact on unemployment of various policy variables (e.g., unemployment benefits

– Solon, 1979); issues of labour market discrimination (Stratton, 1993) and migrant assimilation (McDonald and Worswick, 1997); and many others.[7]

In our empirical analysis we use a parsimonious specification, making the probability of unemployment a function of an individual's education (*E*), age (*A*), gender (*S*), ethnicity (*F*), marital status (*M*) and household size (*H*). We measure education in terms of imputed years of schooling, based on information about the level of education completed. Age is measured using five age-bands[8] to allow for non-linear and threshold effects, while gender, ethnicity and marital status are modelled as dichotomous variables that take the value of 1 for those female, foreign-born and married/cohabiting, respectively. Household size is a continuous variable measuring the number of people of all ages in the household. Thus, our estimating relationship is

$$Prob(U_i = 1) = \Phi\left(a + \beta_E\, E_i + \beta_S\, S_i + \beta_F\, F_i + \beta_M\, M_i + \beta_H\, H_i + \sum_j \beta_A^j A_i^j + \varepsilon_i\right) \qquad (4)$$

where *j* stands for the different age-groups. The *β*-coefficients in this model are difficult to interpret, as they are measured in terms of z-scores of the standard normal cumulative distribution. Thus, when presenting our regression results we convert these coefficients into marginal effects using the -margins- command in STATA 12 (Williams,

[7] Another approach in the literature to examine such issues is with the use of unemployment duration models (e.g., Ham and Rea, 1987). We do not follow this approach here for two reasons. First, as mentioned above, because we are interested in the distinction between demand (net unemployment risk), supply (labour quality) and matching efficiency (valuation) influences on aggregate unemployment risk – i.e., in a decomposition of these that cannot be performed with the use of duration models. Second, because good-quality data on unemployment duration are not available in Greece.

[8] These correspond to 10-year intervals (15-24, 25-34, 35-44, 45-54 and 55-64). We use the prime-age group (35-44) as the reference (excluded) category.

2012), evaluating the impact of each variable at average sample values for all the regression predictors.

Given our interest in the regional dimension, we estimate this model separately for each of the 15 Greek regions. Thus, parameter α in (4) is essentially a region-specific fixed-effect, reflecting the rate of regional unemployment net of the characteristics of the regional workforce.[9] In this way, equation (4) allows us to separate between two types of influences driving aggregate (average) unemployment in each region: one that can be labelled as the 'baseline' level of unemployment, which is independent of personal characteristics or of their 'marketability' (i.e., of their propensity to push a person into unemployment) and can thus be seen as an indicator of effective demand in each region; and another comprising of the individual contributions that each workforce characteristic makes to unemployment. By estimating these for different regions or years, we can actually measure the extent to which changes in unemployment over time (or differences across regions) are due to changes/differences in the quality/mix and marketability of specific characteristics (corresponding to supply and valuation/matching problems) or, instead, due to changes/differences in effective demand.

We can extend this analysis by disentangling further the supply/valuation effect. The standard approach for this in a linear regression framework is by means of a decomposition analysis.[10] In non-linear models, however, this decomposition is not straightforward, as the different effects in the right-hand-side of the model are not additive

[9] Formally, the fixed effect captures, for each region, the probability of unemployment for a non-married prime-age native male with no education in a single-person household.
[10] See Jann (2008) for an accessible presentation of the various decomposition techniques and their implementation in empirical analyses.

and thus the conditional expectation of the dependent variable will not be equal to the regression prediction at mean sample values.[11] An early solution to this problem was proposed by Gamulka and Stern (1990) for the aggregate decomposition, while more recent contributions have allowed also the implementation of variable-specific decompositions (Yun, 2004) as well as decompositions of the imputed marginal effects (Fairlie, 2005).

The decomposition approach in these cases follows the same logic as the standard Blinder-Oaxaca decomposition for linear models. Starting from the general model presented in (3), we calculate average group-specific unemployment probabilities for two different groups, say regions A and B, and decompose their differences as follows:

$$\overline{Prob(U=1)_A} - \overline{Prob(U=1)_B} = \left[\overline{\Phi(X_A\beta_A)} - \overline{\Phi(X_B\beta_A)}\right] + \left[\overline{\Phi(X_B\beta_A)} - \overline{\Phi(X_B\beta_B)}\right] \quad (6)$$

where the bar above each term denotes sample averages. As in the standard Blinder-Oaxaca decomposition, the first bracket on the right-hand side gives the difference in average unemployment between regions A and B which is due to differences in workforce characteristics; while the second bracket gives the part of the unemployment differential that is due to differences in the value attached to the various characteristics.

As with the linear decomposition, these components can be 'evaluated' at different reference values. The decomposition shown in (6) corresponds to the standard Blinder-Oaxaca approach, whereby 'endowments' are evaluated at region A coefficients while the

[11] Formally, $E(Y_i|X_i) \neq \bar{X}\hat{b}$. See Bauer and Sinning (2008) for a discussion of this.

‘coefficients’ component is measured on the basis of region B characteristics. Other decompositions are also possible: for example, the pooled-estimate decomposition (Neumark, 1988) can also be adapted for the case of non-linear models, allowing the ‘endowment’ effect to be expressed in terms of full-sample coefficients.[12] The same applies for the case of the three-way decomposition proposed by Daymont and Andrisani (1984), which separates between an ‘endowment’, a ‘price’ and an ‘interaction’ effect.

Implementing any of these decompositions is useful, but in relation to our earlier discussion it imposes a crucial problem: the price effect derived from such aggregate decompositions includes the contribution to regional unemployment differentials of the region-specific fixed-effects. This prohibits us from distinguishing between ‘effective demand’ (fixed-effect) and ‘valuation’ influences (‘coefficients’ effect for individual-specific characteristics). To overcome this problem, we need to revert to a variable-specific decomposition. A method for this, in the case of non-linear models, was proposed by Yun (2004) and is implemented in STATA using the -oaxaca- command developed by Jann (2008). The method also performs a correction for the ‘decomposition identification problem’ (Oaxaca and Ransom, 1999; Yun, 2005).[13] With the use of this technique, we are able to decompose any observed unemployment differential between two groups of regions into three

[12] In that case, the ‘price’ effect is essentially measured as the difference between average characteristics in A valuated in terms of the price advantage in A relative to the full sample and the average characteristics in B valuated in terms of the analogous price advantage in B.

[13] The problem arises in models that include dichotomous variables as regressors, as the value of the estimated intercept becomes dependent on the reference category selected. The technique used here (Yun, 2005) corrects for this by essentially averaging out across estimates derived from the use of alternative reference categories. As a result, the estimated fixed-effects become independent of the choice of reference categories for the dichotomous variables, allowing their interpretation here as measures of effective demand (in this case, irrespective of the ‘baseline’ profile).

distinctive components: one capturing differences in labour quality (the ‘endowment’ or ‘explained’ component); one capturing differences in the valuation of marketable characteristics and thus in the mix of attributes (e.g., skill-content) demanded in each labour market (the sum of the individual variable-specific ‘coefficient’ components); and one capturing differences in effective demand across the two groups of regions (the estimated variable-specific ‘coefficient’ component corresponding to the fixed-effect).

With this “technology”, we set out to explore the questions elaborated earlier, concerning the sources of unemployment in Greece and their regional differentiation before and during the crisis. In the empirical analysis that follows we use data from the spring-quarter waves of the Greek labour force survey for the years 2000-2012. We derive information on the range of individual and family characteristics depicted in equation (4) and restrict our sample to working-age respondents who were either employed or had actively looked for a job in the two weeks prior to the survey. After some data cleaning, the typical year contains some 30,000-35,000 observations.[14] Some basic descriptive statistics for our key variables (for selected years) are presented in the Appendix.

3. Unemployment risk in the Greek regions

The first task in our analysis is to measure the individual contribution of various personal and household characteristics to unemployment risk and their differentiation over time and across space. With over half a

[14] The number of observations in the Greek Labour Force Survey declines in more recent years. In 2012, our effective sample includes just over 25,000 observations.

dozen such characteristics evaluated across 15 regions over a 13-year period (2000-2012), the number of estimated coefficients that we are potentially interested in exceeds 1,500. To facilitate presentation and discussion, we make use of GIS tools and present a number of maps where we depict, for each variable of interest, the corresponding marginal effect derived for each of the 15 regions of Greece over two periods: before (2005-2008) and during the crisis (2009-2012). Full tables of results for all 15 regions for selected years (2000, 2004, 2008 and 2012) reporting marginal effects are given in the Appendix.[15] We make selective reference to region- and year-specific estimates in the text, where relevant. Overall, our probit regressions perform well, with the Wald statistic testing for the validity of the model being always significant at even the 0.1% and an average value for the McFadden pseudo R-squared of 0.12.

3.1 ‘Baseline’ unemployment risk

Starting with the region-specific fixed effects, we note that these are always statistically significant and negative in the early periods, indicating low ‘baseline’ probabilities of unemployment before the crisis (see Table A.2 and Figure 2), but become statistically weaker and sometimes even positive during the crisis. In 2000, the estimated fixed-effects range from -0.84 to -2.58, corresponding to ‘net’ unemployment rates[16] of between 0.5% (in the South Aegean) and 20% (in Western Macedonia) – with the two main metropolitan areas (Athens and

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[15] Direct regression estimates (z-score coefficients) and full results for all years can be made available upon request.

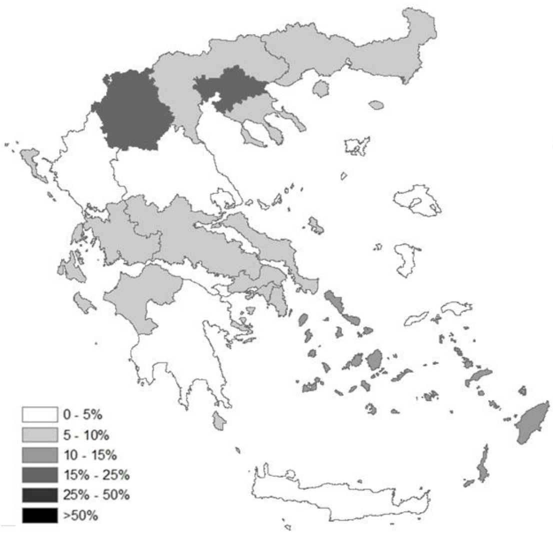
[16] Net unemployment rates deriving from the fixed effects have been calculated using the one-sided cumulative function of the standard normal distribution. As noted already, these rates should not be seen as absolute measures of effective demand but rather as the unemployment-risk probabilities corresponding to our ‘baseline’ individual.

Thessaloniki) not far behind the maximum value. Importantly, in some cases the predicted 'net' unemployment rates deviate significantly from the actual unemployment rates observed: for example, Ipeiros has a net unemployment of 4.9% but an actual rate of 11.4% (for the South Aegean the corresponding values are 0.5% and 6.3%); while North Aegean, with an actual rate of 8.0% returns a 'net' unemployment of 16.4%. Such differences inevitably reflect underlying differences across regions in labour quality and matching efficiency / valuation. In the above example, the North Aegean appears to have superior labour quality and/or to be much more effective in matching available skills to local jobs compared to Ipeiros (or the South Aegean).

Figure 2. Baseline unemployment risk, by region and selected years

(a) 2000

(b) 2004



(c) 2008

(d) 2012

<u>Notes:</u> 'Baseline' unemployment rates have been calculated using the one-sided cumulative function of the standard normal distribution for each of the estimated regional fixed effects from the probit regressions. See discussion in the text for more details.

Over time the estimated 'net' unemployment rates change in interesting ways. While between 2000 and 2004 the (unweighted) average prediction of 'net' unemployment remains rather stable (from 9.1% to 8.8%), in 2004 the range of net unemployment rates increases quite substantially, with a minimum of 2.4% observed in Central Macedonia (and similar values in Thessaly, the Peloponnese and the North Aegean) and a maximum, again in Western Macedonia, of 32.0%. By 2008, average 'net' unemployment had declined notably (to 7.5%, roughly equal to the actual national unemployment rate at the time) and so did its range (from 3.3% in the North Aegean to 16.0% in Thessaloniki). As we move into the crisis, however, predicted 'net' unemployment rates rise dramatically (in line with the actual rates), reaching in 2012 an average value of 31.5%.[17] In that year, only one region had a net unemployment rate below 10% (South Aegean: 6.2%), while values above 50% were observed in Western Macedonia and the two metropolitan regions (the maximum was in Thessaloniki at 64.9%). Clearly, the crisis has represented a significant shock to the Greek labour market, with net unemployment quadrupling in the space of four years. Still, the effect across space was very heterogeneous, hitting disproportionately the north-western and metropolitan regions (and their hinterlands) but having a much lower impact in the southern and island regions of the country (fourth panel of Figure 2).

As already noted, the estimated 'net' unemployment rates are often significantly, but far from uniformly, different from the actual unemployment rates observed in the regions. This suggests that differences in the mix of workforce characteristics, and especially in the unemployment risk assigned to each of these, play an important role for the level of unemployment attained in each region. Thus, our focus now turns to this latter source of differentiation.

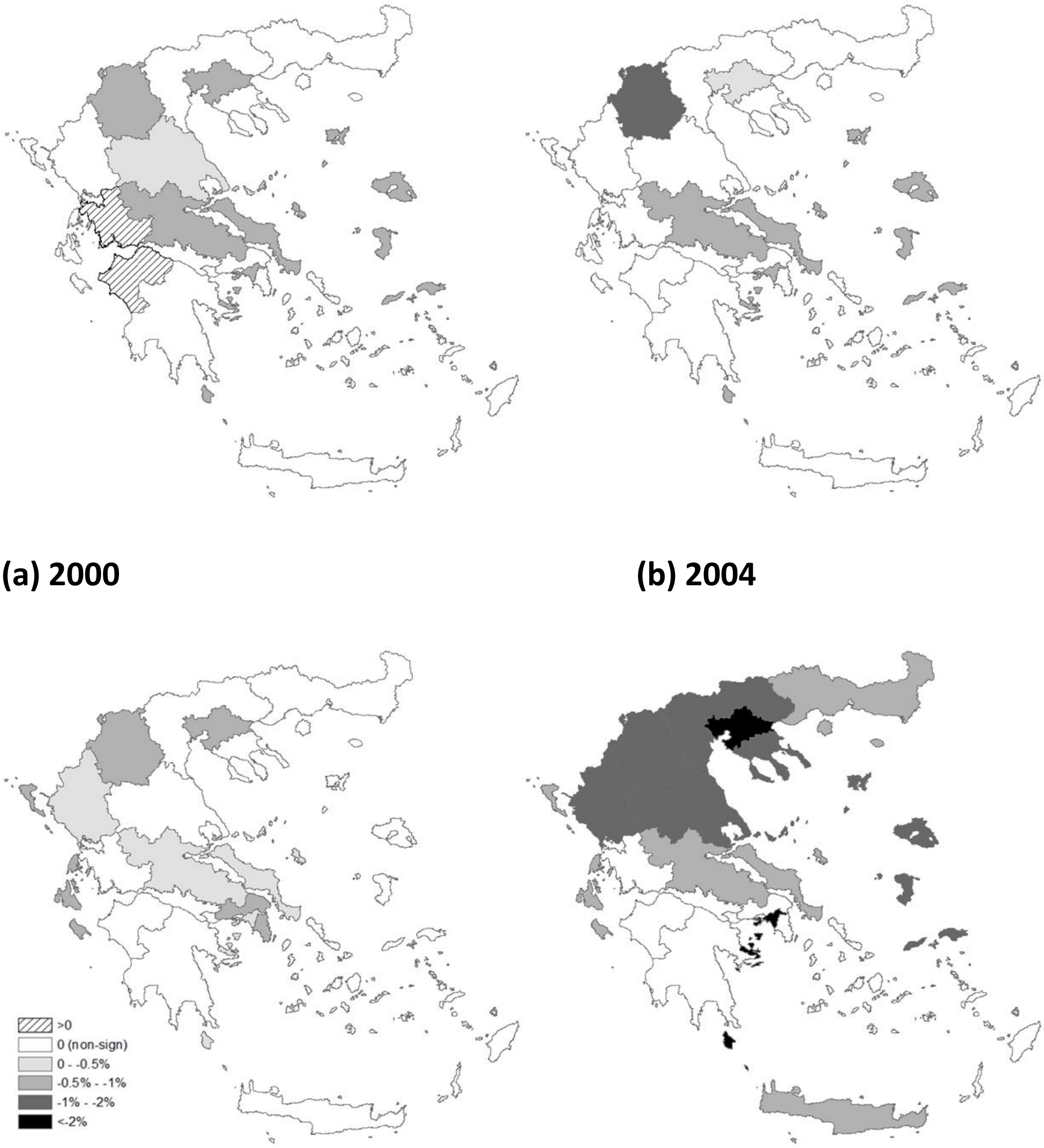
[17] Actual national unemployment in spring 2012 was 24.2%.

3.2 Unemployment risk and education

Starting with the education variable (Figure 3), an interesting observation emerges immediately: for a number of regions, higher levels of education do not appear to be associated with lower levels of unemployment risk. This is true throughout the pre-crisis period for the regions of Eastern Macedonia & Thrace (EMT), Central Macedonia, and Crete; while for the majority of the remaining regions it is true at least for subsets of this period. In fact, education returns a statistically significant negative effect (reducing unemployment) consistently only in the two metropolitan regions (Athens and Thessaloniki) and the two partly-industrialised regions of Western Macedonia (energy sector) and Continental Greece (hosting a part of the Athens industrial complex).

Grouping, however, over the four years preceding the crisis (first panel of Figure 4), produces results with higher statistical significance. In this case, education continues to have no effect on unemployment risk in only four regions (EMT, Thessaly, North Aegean and Crete). The effect is highest in Western Macedonia (where an additional year of schooling is associated with a 1.24% drop in the probability of being unemployed). For most other regions the impact of education is much more modest (between 0.4% and 0.7%), while it is lowest in the more agricultural regions of Western Greece and Peloponnese. It appears that prior to the crisis there was a clear dichotomy between agricultural and non-agricultural regions in the role that education played in mediating unemployment risk: in agricultural regions demand for skilled (in terms of education) labour has been weak – the corollary of this is that these regions have a relative over-supply of education.

Figure 3. Marginal unemployment risk for education, by region and selected years

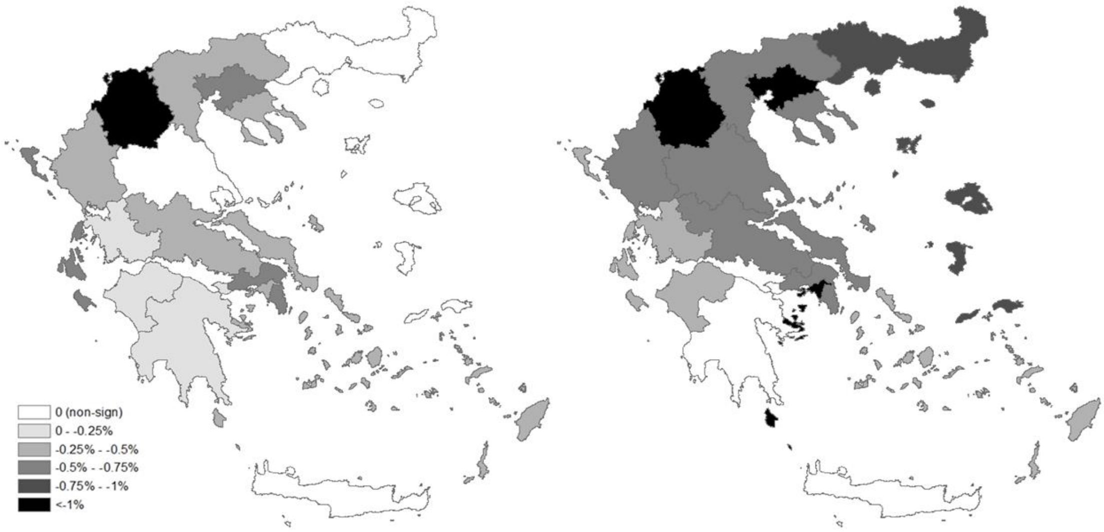


(a) 2000 **(b) 2004**

(c) 2008 **(d) 2012**

Notes: Marginal effects for the continuous education variable calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See discussion in the text for more details.

Figure 4. Marginal unemployment risk for education, by region and period



(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

Notes: See notes in Figure 3.

On the basis of the period-level analysis, the situation appears to have changed only little with the crisis (second panel of Figure 4), with the marginal effect of education remaining rather low in all regions (maximum value is now 1.5% in Thessaloniki, followed closely by Western Macedonia and Athens). The agricultural – non-agricultural distinction is now somewhat less strong, but two regions (Peloponnese and Crete) continue to exhibit no reduced unemployment risk for better-educated workers. The picture however is notably different when comparing individual years. Between 2008 and 2012 (last two panels of Figure 3) the returns to education became positive (from non-significant) in five regions (EMT, Central Macedonia, Thessaly, North Aegean and Crete), while they doubled in Western Macedonia and Continental Greece and grew even faster in Ipeiros, Thessaloniki and Athens. On the other hand, the unemployment risk associated to education increased in Attica and the Ionian, while it remained non-significant in the Peloponnese, Western Greece and the South Aegean.

Given the distinctive role of education as an indicator of skills (and as a screening device for employers), these developments can be used to make inferences about the functioning of the Greek labour market prior and during the crisis. Evidently, large parts of Greece are characterised by an over-supply of skills (over-education). Especially prior to the crisis, this was also reflected in the above-average unemployment rates for university graduates (Livanos, 2010b). The crisis is unlikely to have raised in any significant degree the skill-content of new jobs; but it has created conditions of job-competition and bumping down, leading to lower unemployment risks associated with education in large parts of the country. Still, a number of regions, some of which are at least partly exposed to international demand (e.g., Attica and the touristic region of South Aegean), exhibit even today a curious absence of penalties for lower education. In any case, returns to education (in terms of employment probabilities) in the country, perhaps with the exception of Athens and Thessaloniki, remain even today rather low. In one way or another, these results indicate an overall deficiency in the creation of skilled jobs in the country and possibly also a qualitative mismatch between skills supplied and demanded – suggesting problems of labour market efficiency, at least outside the main urban agglomerations of the country.

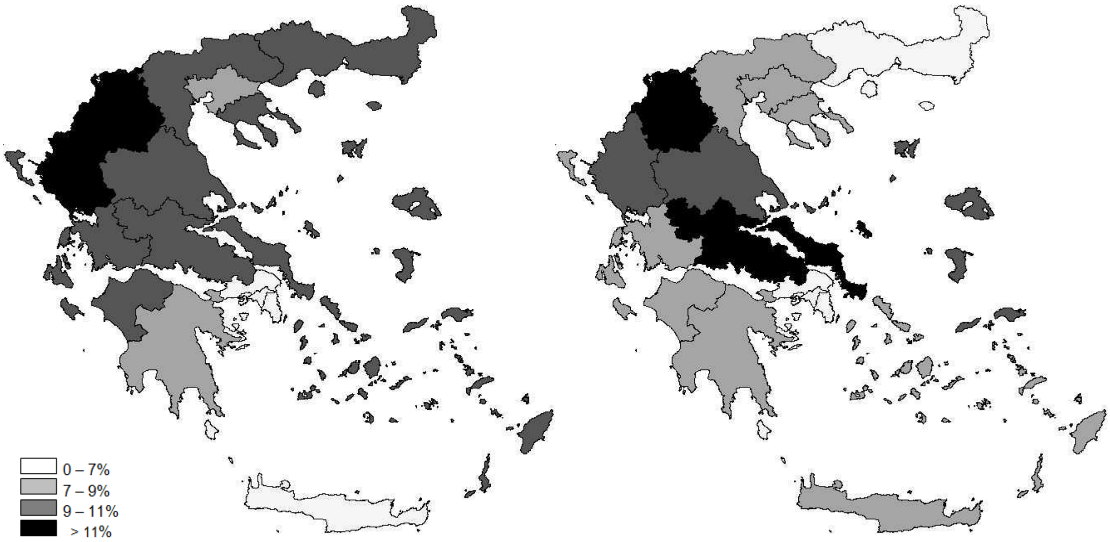
3.3 Unemployment risk for other characteristics

Considerations of labour market efficiency can also be made with regard to gender and ethnicity, two variables that are often associated with the presence of labour market discrimination. In the period 2005-2008, the female penalty (in terms of unemployment risk) ranged between 5.1% in Athens and 12.6% in Western Macedonia (Figure 5). Most of the regions, however, had female unemployment risk coefficients (marginal effects) upwards of 8.5%, consistent with the historical pattern of higher rates of female unemployment in Greece. Although this may possibly be due to a greater availability of 'male' jobs in (parts of) the country, it is likely also an indication of some degree of gender discrimination in the labour market.[18] The effect of the crisis is somewhat difficult to distil from the obtained results. On the one hand, for almost all regions the coefficients obtained from the probit regressions (not shown) have declined substantially, indicating an improvement in the relative position of females during the crisis. On the other hand, the marginal effects calculated for the gender dummy at average sample values (Table A.2) show a mixed picture, with relative unemployment risk rising in the majority of regions (especially Thessaly, Continental Greece and Crete) and only declining in a few (EMT, Ipeiros, Western Greece and Athens). The difference between the two sets of results is clearly attributable to the compositional changes in workforce characteristics that have occurred between the two periods. Combining the two sets of results, it is perhaps safe to conclude that the crisis has not brought about an absolute improvement in the labour market position of females (a fall in

[18] Analyses of the female wage penalty in Greece have shown that this is quite substantial, especially outside the public sector, and indeed can be associated to labour market discrimination, as a large part of it survives even after controlling for other personal and job characteristics (Kanellopoulos and Mavromatas, 2002; Livanos and Pouliakas, 2009; Christopoulou and Monastiriotis, 2013).

'discrimination') but rather only a *relative* improvement which is due to the rising exposure of males to unemployment risk.

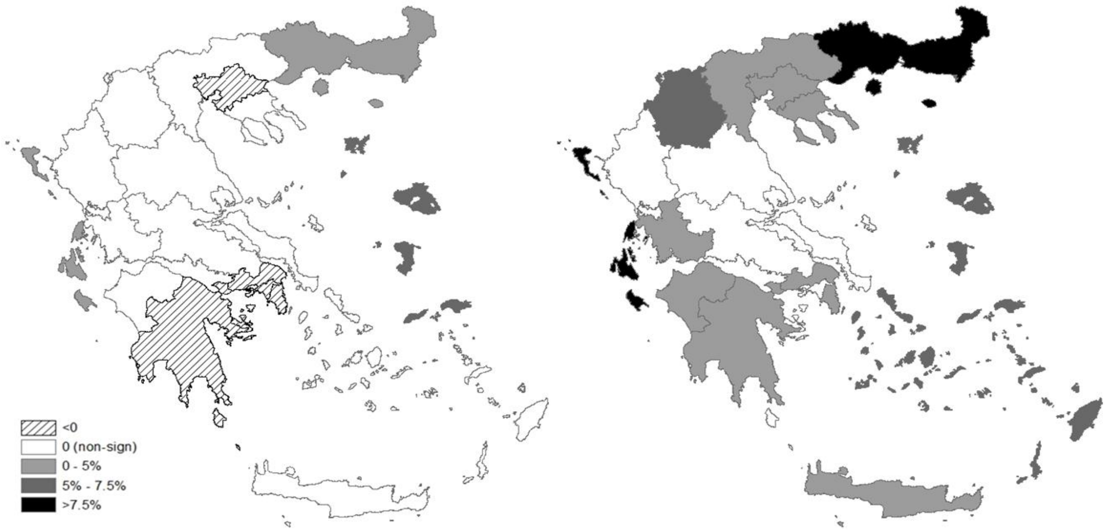
Figure 5. Relative unemployment risk for females, by region and period



(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

Notes: Marginal effects for the gender dummy calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See the text for more details.

Figure 6. Marginal unemployment risk for being foreign-born, by region and period

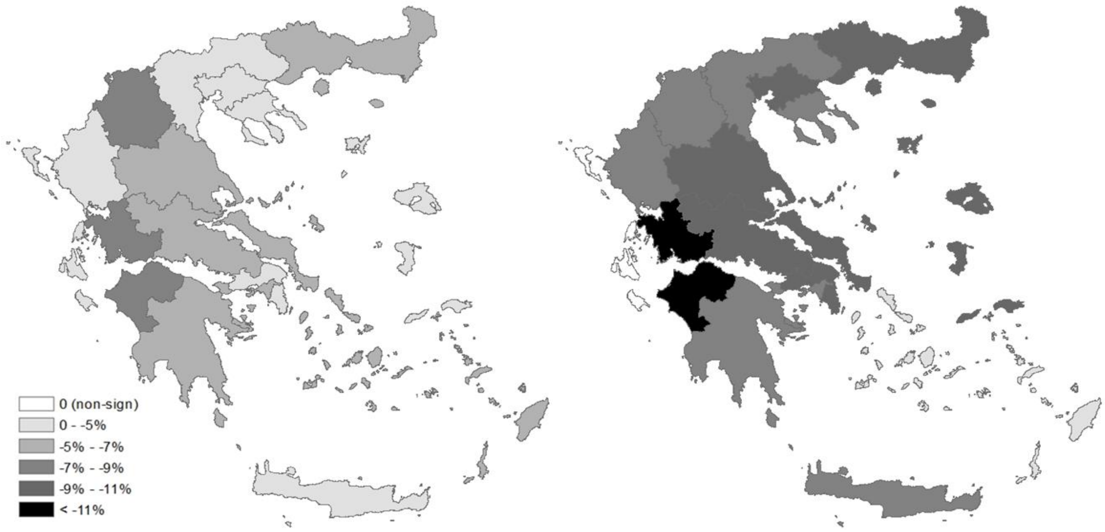


(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

Notes: Marginal effects for the foreign-born dummy calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See the text for more details.

The trajectory followed in the case of the penalty for migrants (foreign-born – Figure 6) is much more clear-cut and shows a significant deterioration in their labour market position (and thus, arguably, rising discrimination). Historically, unemployment risk probabilities for this variable were generally low (and only positive in three regions: Ionian, EMT and North Aegean), while unemployment risk was lower for migrants in four regions, including the two metropolitan regions of the country. Since the crisis, however, unemployment risk for this group has increased substantially, reaching very high values especially in the regions where this was already high. By 2012, this risk reached extremely high values also elsewhere, including Thessaloniki, North and South Aegean, Crete and Attica – while it climbed to 27% in EMT (see Table A.5).

Figure 7. Marginal unemployment risk for being married, by region and period



(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

<u>Notes:</u> Marginal effects for the married-status dummy calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See the text for more details.

Figure 8. Marginal unemployment risk for household size, by region and period

(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

Notes: Marginal effects for the continuous household-size variable calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See the text for more details.

In contrast to these changes, unemployment risk associated to household characteristics (marital status and household size) exhibited a rather low spatial differentiation prior to the crisis and has changed rather uniformly since the crisis. Married people had generally a lower probability of unemployment; in most cases (except in the Ionian, South Aegean and Western Macedonia), this effect intensified with the crisis (Figure 7), doubling in size in the regions of Thessaloniki, Central Macedonia, Attica, Crete and North Aegean and, by 2012, reaching values near or above 12%. Similarly, the unemployment risk assigned to household size – this time a positive one – was generally low (or non-significant) in the pre-crisis period but has increased notably during the crisis (except in Crete), reaching by 2012 values near or above 5% in EMT and the North and South Aegean (Figure 8).

Figure 9. Marginal unemployment risk for youth, by region and period

(a) Pre-crisis (2005-08) **(b) Post-crisis (2009-12)**

Notes: Marginal effects for the 16-24 age-group dummy calculated at average sample values and derived from region-specific probit regressions of individual unemployment risk. See the text for more details.

Our last set of results concerns the incidence of unemployment across different age groups. As noted earlier, in our analysis we have used the age group of 35-44 as our base category, so the reported results can be seen as the additional unemployment risk of a particular age group *relative* to that of the 35-44 group. The result that stands out, invariably in all cases except for the South Aegean in the pre-crisis period, is the relative unemployment risk associated to youth (Figure 9).[19] Before the crisis, the additional unemployment risk associated to youth was near or above 10% in the north and north-west regions (EMT, Central Macedonia, West Macedonia, Ipeiros, Ionian, and North Aegean); but it was between 6-7% in the metropolitan regions (Athens and Thessaloniki), and notably lower (4% or less) in the south and south-east

[19] All other estimated unemployment risks are either non-significant (typically for the age-group of 45-54) or very small (typically, around 2% for the 25-34 group and -1.5% for the 55-64 group).

regions (Attica, South Aegean and Crete). This geographical distribution changed quite sizeably during the crisis: parts of the north (West Macedonia, Ipeiros and Central Macedonia) continued to be on the top of the distribution, but other parts of this group (Ionian and North Aegean) have now amongst the lowest youth penalties (together with Crete). The South Aegean and Attica, which in the past carried small or no youth penalties, have now a penalty of over 12%, and group together with Continental Greece and Thessaloniki, which also saw sizeable increases in this penalty. In contrast, Athens, EMT and the Peloponnese only saw rather modest increases. Overall, between the two periods the relative unemployment risk for the 15-24 age-group rose by over 50%. It should be noted, however, that – as with the case of the female penalty – this effect is almost entirely compositional, as the direct probit estimates (z-scores) present a rather different picture, with the youth unemployment penalty being in the vast majority of cases not significantly different, in a statistical sense, between the two periods.

Changes in the relative unemployment risk for other age groups are much more modest (typically less than 20% and often negative or non-significant) – with the exception perhaps of West Macedonia and Continental Greece, where the unemployment risk for older age groups (relative to the 35-44 group) declined rather substantially, and the regions of Thessaly, Thessaloniki and Western Greece, where the relative unemployment risk for the 24-35 group increased quite sizeably (see Tables A2-A5 in Appendix).

4. Decomposition analysis: macro-geographies of unemployment

The analysis undertaken thus far has revealed a at times substantial degree of regional differentiation both in terms of the unemployment risk assigned to individual characteristics and in terms of changes in this risk during the crisis. Moreover, it has revealed that compositional changes (or differences between regions) may be playing an important role in determining the size of the imputed unemployment risk (marginal effects) for different characteristics. To disentangle the effect of such compositional movements/differences from that of pure valuation changes, we proceed in this section to a decomposition analysis as explained in section 2. We do not implement this decomposition for each region separately but rather apply our analysis on a number of regional groupings that we construct. This is partly for ease of presentation, but also serves the additional purpose of allowing us to explore the spatial variation in the incidence and the determinants of unemployment risk along wider geographical lines and divisions (macro-geographies) – and to link these to possible structural or systemic factors that may be responsible for the observed variation.

Among the possible factors of differentiation, we look in this paper at factors that have to do with differences in production structures (agricultural versus non-agricultural regions), agglomeration (Athens, as the only significant financial and economic centre in the country, versus the rest of Greece), physical geography (island versus mainland regions), historical-political geography (north versus south), and labour market performance (high- versus low-unemployment regions). Membership of regions to these groups is presented in the Appendix. We base our analysis on the Neumark (pooled-estimate) decomposition, which expresses the 'endowments' component in terms of average (full-sample) coefficients.[20] Consistent with our earlier discussion, which separated between three types of effects (effective demand, labour quality and valuation of endowments), we present two sets of results for each decomposition. The standard decomposition is presented by means of graphs; while the decomposition splitting further the 'coefficients' component into 'valuation' and 'effective demand' is presented in summary form (selected years) in a table. As will become clear later, this is because splitting the standard 'coefficients' component into these two sub-components produces large differences that are difficult to present graphically.[21]

We start our discussion here with a decomposition on the basis of production structures (agriculture).[22] Figure 10 reveals an interesting picture of a decade-long difference that has been substantially altered by the crisis. Until 2008, unemployment in agricultural regions oscillated between half and two percentage points above the rate found in non-agricultural regions. By far, the biggest part of this differential was due to this group's inferior performance with regard to the valuation of workforce characteristics ('coefficients' component). In other words, most of the higher unemployment in these regions in the 2000-2008 period is attributable to the relative inability of their labour markets to channel into employment individuals possessing characteristics that in

[20] Results using other decomposition methods produce qualitatively similar conclusions and are available upon request.

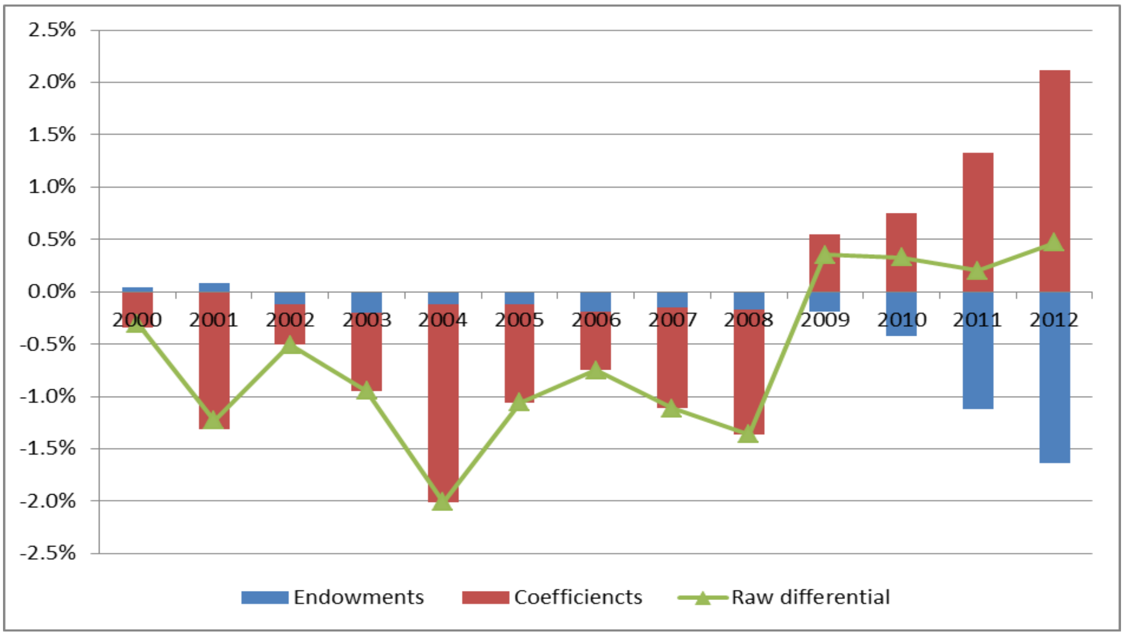
[21] Lopez-Bazo and Montellon (2013), in their regional decomposition of unemployment risk (for the case of Spain), also find substantial differences within the 'coefficients' component.

[22] Recall from section 2 that specialisation in agriculture appeared as a potentially relevant factor of differentiation in the case of education, with more agricultural regions having lower unemployment risks associated to education, especially prior to the crisis.

non-agricultural regions were typically producing less unemployment.[23] The situation seems to have been reversed with the crisis. As early as in 2009, and increasingly over time, the 'coefficients' component becomes positive, suggesting that the valuation of workforce characteristics is now more advantageous in agricultural regions – which now have below-average unemployment rates (albeit marginally so). The 'endowments' component moves in the opposite direction, becoming more and more negative, indicating in turn that non-agricultural regions obtain an increasing relative advantage in terms of workforce skills. Without this, the unemployment differential would have been significantly higher – by over 1.5 percentage points in 2012 (four times higher). This is an extremely interesting observation, especially in relation to common perceptions about an 'exodus' of talented workers to the countryside.[24]

[23] In fact, when valuated at coefficients obtained for the non-agricultural group (standard Blinder-Oaxaca decomposition), the 'endowments' component is positive, suggesting that agricultural regions had higher concentration of workforce characteristics that were more 'marketable' in the non-agricultural regions.
[24] See for example the Guardian, 13/5/2011 (available at http://www.guardian.co.uk/world/2011/may/13/greek-crisis-athens-rural-migration).

Figure 10. Neumark decomposition for agricultural – non-agricultural regions



As discussed earlier, we can disentangle further the 'coefficients' component into a 'valuation' and an 'effective demand' effect. Table 1 reports this for the years 2008 and 2012 (before / after the crisis) for all the decompositions performed in this paper. The table depicts the raw unemployment differential (with unemployment being higher in agricultural regions in 2008 and lower in 2012); the endowment (or labour-quality) component, which as we saw earlier worsened substantially between the two years; and the two sub-components of the 'coefficients' component. The latter reveal a very interesting picture. In contrast to what is shown in Figure 10, the valuation of workforce characteristics has continued to push also in 2012 towards higher unemployment in agricultural regions – in fact, increasingly so. In other words, labour markets in agricultural regions continue to disadvantage otherwise advantageous workforce characteristics also during the crisis. Instead, the whole of the 'coefficients' effect depicted in Figure 10 is driven by the fixed-effect coefficient (a change in 'effective demand') which has pushed towards less unemployment compared to non-agricultural regions both before the crisis and much more so in 2012. This shows that effective demand has declined much more strongly in the non-agricultural regions. The decline was so strong that it led to an overall unemployment disadvantage despite those regions' ability to attract, and especially to direct into jobs, a workforce with more 'marketable' characteristics.

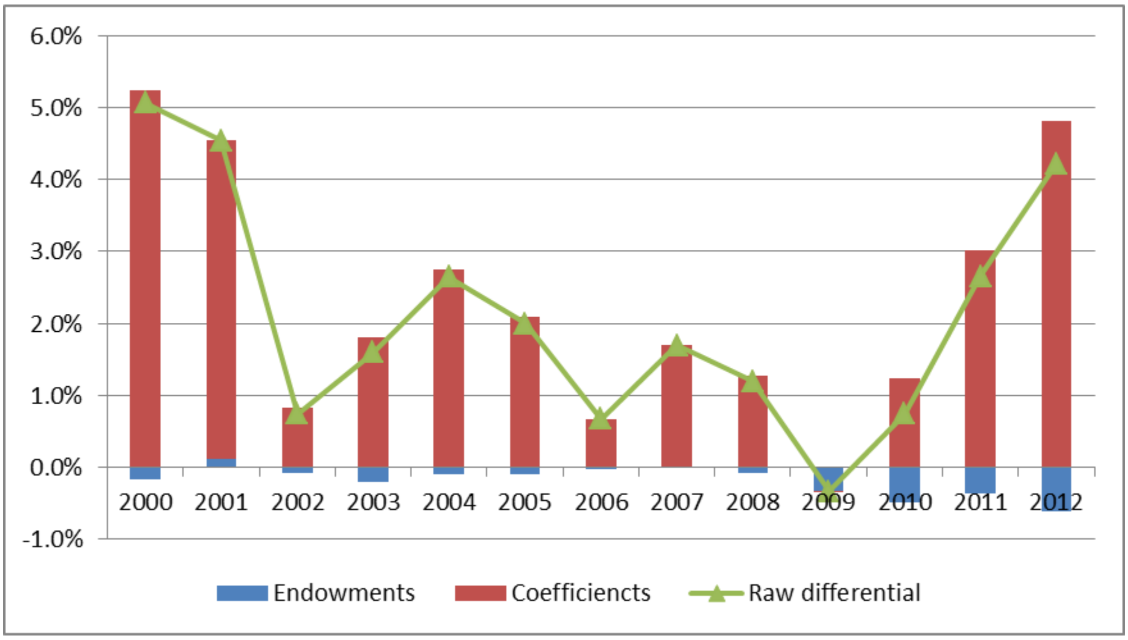
Table 1. Further decomposition of unemployment differentials prior and during the crisis

Decomposition	*Year*	*Raw differential*	*Labour quality (endowments)*	*Valuation of endowments*	*Effective demand*
Agriculture - non-agriculture	2008	-1.362	-0.175	-4.675	3.488
	2012	0.472	-1.641	-7.610	9.723
Island - mainland	2008	1.194	-0.083	2.451	-1.174
	2012	4.211	-0.608	-3.404	8.223
North-south	2008	-1.944	0.113	1.173	-3.229
	2012	-1.231	-0.154	7.320	-8.396
Rest of Greece – Athens	2008	-2.460	-0.169	0.715	-3.006
	2012	-0.553	-1.917	-13.699	15.064
Above - below average (year-specific)	2008	-2.888	-0.106	-0.220	-2.563
	2012	-4.652	-0.823	-3.912	0.083
Above - below average in 2000	2008	0.812	0.207	0.996	-0.391
	2012	-3.029	1.559	10.890	-15.478

Notes: authors' calculations using the variable-specific Neumark decomposition for non-linear models proposed by Yun (2004) and the normalisation correction of Yun (2005). The reference groups of regions are those listed first in each decomposition. Negative values denote higher unemployment for the reference group. All data are expressed in percentage points.

The role of effective demand is important also along other dimensions. Turning to the island – mainland distinction (Figure 11), we first note that unemployment differentials between these two groups have been rather volatile over the years, but were particularly high (near 5%) in the beginning and the end of the period, rising sharply during the crisis. The differential has throughout the period been driven by the 'coefficients' component, as the endowments component is by comparison very low. In 2008, much of the differential was accounted for by a more advantageous valuation of endowments, as effective demand was lower than in mainland Greece (Table 1). In contrast, in 2012 the effective demand component became hugely important in giving an unemployment advantage to the island regions, as apparently effective demand collapsed much more strongly in mainland Greece. According to the 'valuation' component, mainland regions responded to this fall in demand by improving the way in which they reward (in terms of employment probabilities) the characteristics of their workforce: this helped contain the sizeable fall in relative demand, producing a raw unemployment differential which is almost half the 'effective demand' differential (4.2 and 8.2, respectively).

Figure 11. Neumark decomposition for mainland – island regions

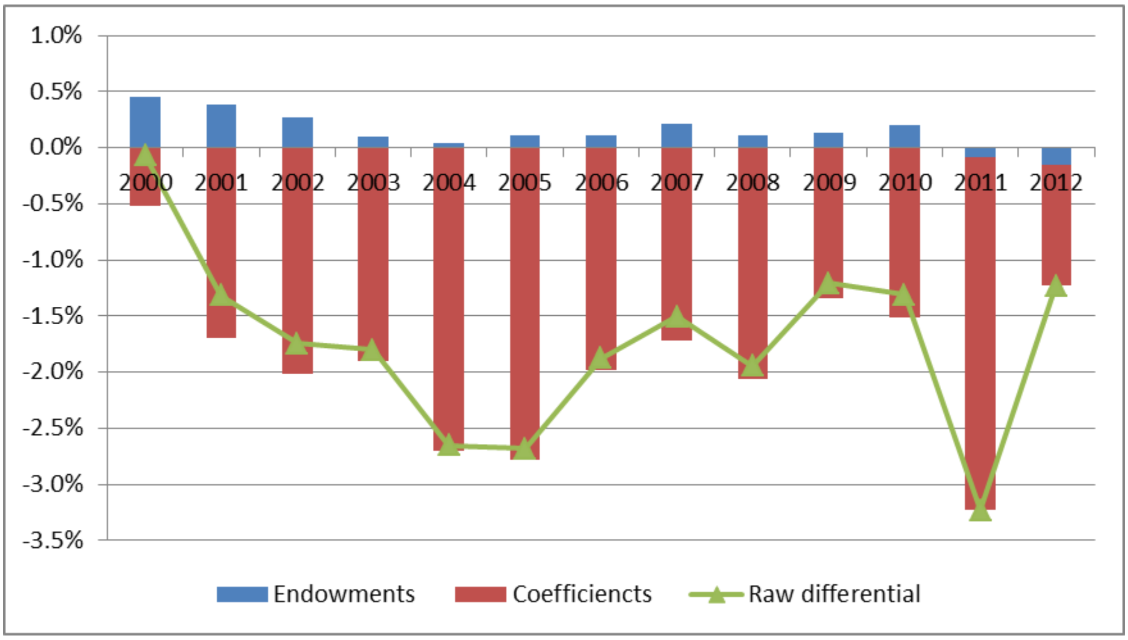


Another important geographical distinction for Greece is that between the north and the south. There is an interesting political history associated to this, as the northern parts of the country were historically more deeply integrated with the Balkans and were unified with Greece between 60 and 80 years after the establishment of the modern Greek state. But there is also a more contemporary dimension to this distinction, encompassing concerns about cultural differences and differences in political representation and access to power.[25] As can be seen from the Neumark decomposition (Figure 12), the north had higher rates of unemployment throughout the period. The differential increased in the first half of the 2000s, a development that was perhaps not unrelated to Greece's entry into the Eurozone and the 2004 Athens Olympics. Whereas it subsequently subsided, in 2011 it seemed like the crisis may had re-ignited the north-south divergence. However, 2012

[25] See Mazower (2002) for the history of Greece in the Balkan and Ottoman context. See also Nedos (2007) for a light review of contemporary cultural differences.

saw a remarkable drop in the raw unemployment differential, possibly as the political instability at the time caused a larger shock in parts of the south and especially Athens (see Figure 13). For most of the period, the north possessed a small advantage in workforce characteristics ('endowments' component), which turned however into a disadvantage since 2011. But by far the main element in the unemployment differential is the 'coefficients' component. From Table 1, this appears solely attributable to a relative disadvantage in terms of effective demand, as the northern regions possess a relative advantage in terms of valuation / matching, which has been strengthened with the crisis.

Figure 12. Neumark decomposition for north – south regions

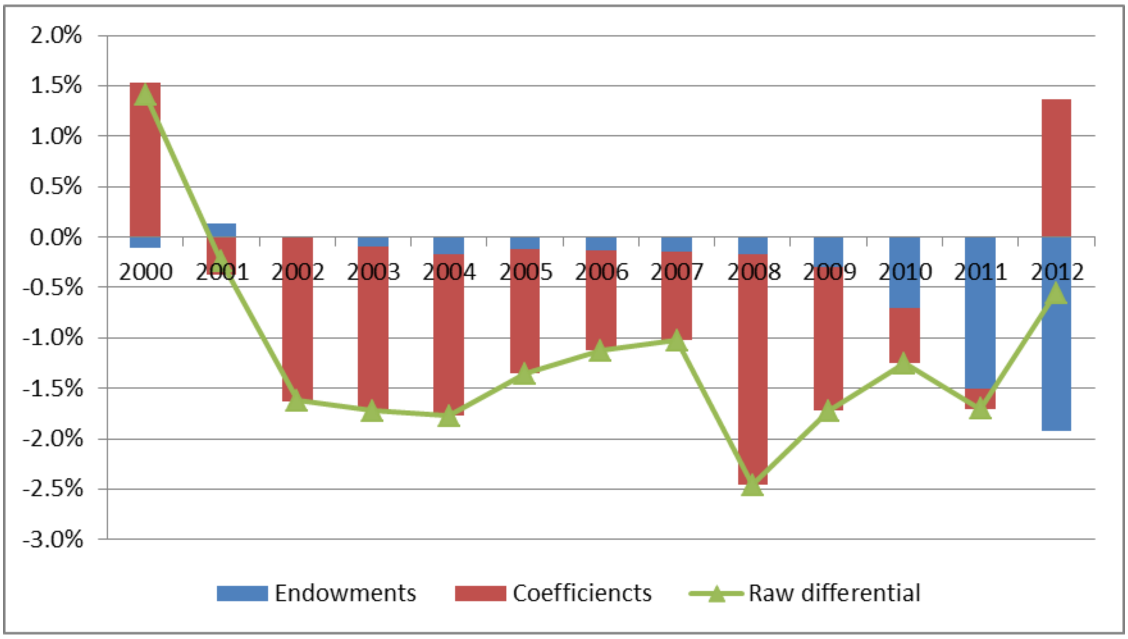


The north-south distinction leads us to another important geographical distinction for the country, that between Athens – the country's capital and main economic, financial and political centre – and the rest of Greece. Although unemployment was higher in Athens in 2000, the capital has had lower unemployment than the rest of the country from

2001 onwards (Figure 13).[26] The decline of relative unemployment for the capital in the early period appears to have been due to a relative improvement in the 'coefficients' component, which remained advantageous until recently but by 2012 had turned into a disadvantage (with a sizeable decline during the crisis). Instead, the 'endowments' component started becoming more advantageous for Athens with the crisis, pushing unemployment downwards (relative to the rest of the country) by almost 2 percentage points by 2012. But the main factor containing unemployment in Athens during the crisis appears to have been the capital's ability to adjust to the huge demand shock instigated by the crisis: according to the decomposition of Table 1, between 2008 and 2012 Athens experienced a fall in effective demand, relative to the rest of the country, of over 15 percentage points; the containment of the unemployment differential to just over half a percentage point by 2012 was for the largest part attributed to a huge rise in the capital's 'valuation' advantage, showing a far better ability to mobilise 'marketable' workforce characteristics relative to the rest of the country. This finding seems to compromise two rather antithetical views about the geography of the crisis in Greece: on the one hand, the common perception that the crisis hit hardest the capital; on the other hand, that unemployment has reached exceptionally high levels more outside Athens than in the capital.

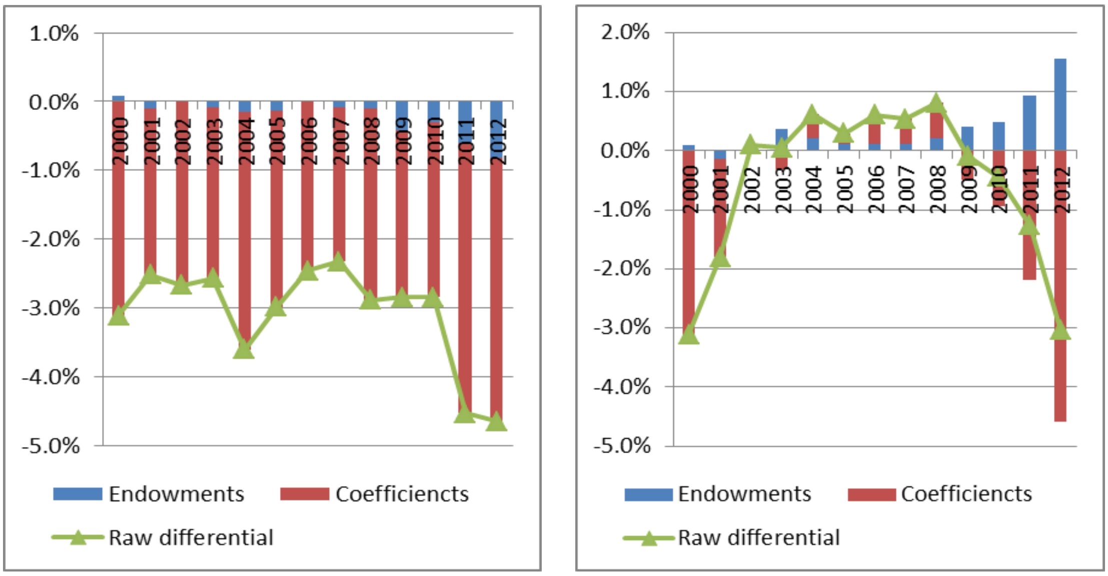
[26] An interesting observation with regard to Athens is the significant decline in relative unemployment in 2008, the year immediately before the crisis, when Greece – quite ironically – achieved its lower unemployment rate for almost two decades. On the basis of Figure 13, it appears that the achievement of this historical low was in large part driven by the performance of the capital's labour market.

Figure 13. Neumark decomposition for Athens – rest of Greece



We take this point further in the discussion of our results in the next section. Before concluding this section, we perform another decomposition, this time along the lines of high/low unemployment. We do this using two different methods of classifying regions into high / low groups (Figure 14). First, by allowing membership into the high-unemployment group to vary year-by-year, according to whether a region has above-average unemployment in that particular year. Second, by including into the high-unemployment group all regions that had above-average unemployment rates in 2000 (fixed membership).

Figure 14. Neumark decomposition for high – low unemployment regions



On the basis of the first decomposition, we see that the crisis has led to a sizeable increase in the raw differential between regions of above- and below-average unemployment. As the overall dispersion of regional unemployment rates has in fact declined during the period (Table A.1), this suggests a move towards a bimodal distribution of unemployment, with an increasing separation between 'good' and 'bad' performers. This rise is due to a deterioration both in the 'endowments' and in the 'coefficients' component. Quite naturally, the main bulk of the differential is accounted for by the latter, i.e., by differences in the functioning of the respective labour markets. The results in Table 1 reinforce this point, showing that the 'coefficients' effect is indeed linked to problems of labour market functioning ('valuation' component), as the component corresponding to effective demand has in fact pushed towards less unemployment in the high-unemployment regions in 2012. In other words, in the year that represented the height of the crisis, high-unemployment regions were not those that experienced a deeper demand shock but rather those that failed to sufficiently ‘reward’ available and otherwise marketable workforce characteristics.

The fixed-membership decomposition (second panel of Figure 14) offers another interesting observation. As can be seen, the regions suffering most today were performing, as a group, above the national average for most of the period prior to the crisis; but they had a significantly worse unemployment performance in the first years of the century (and possibly also in the 1990s). This is consistent with the view that the crisis has affected most those regions that had benefited more from the boom years after Greece’s entry into the Eurozone. Interestingly, in both 2008 and 2012, these regions had better workforce characteristics and better valuation of those characteristics (Table 1) – they had in other words better-functioning labour markets and a more ‘marketable’ workforce. However, already in 2008 and much more emphatically in 2012, they had substantially lower effective demand relative to the rest of the country. This reaffirms the interpretation of these regions as the regions on the top of the boom-and-bust cycle.

5. Conclusions

The crisis has led to an unprecedented increase in unemployment in Greece, raising concerns about economic sustainability and social cohesion in the country. Given the huge shock nationally and perhaps the political and economic centrality of Athens, attention to the spatial dimension of the crisis has been subdued. This is reinforced by the fact that, at the aggregate level, spatial patterns of unemployment and unemployment evolutions are rather mixed and difficult to describe using macro-geographical distinctions.

In this paper we moved beyond the descriptive diagnosis of 'rising unemployment' and, making use of recent advances in decomposition techniques, we examined the dynamics of unemployment and labour market adjustment in the Greek regions using micro-data from the Greek LFS. We identified, and were able to measure, three distinctive influences on the regional labour markets, corresponding to differences/changes in labour quality, matching efficiency (valuation) and effective demand. Differences in effective demand, especially during the crisis, were found to be large, with the demand shock hitting disproportionately the metropolitan and north/north-western regions. Adjustment in terms of valuation of workforce characteristics (matching efficiency) was also heterogeneous, being stronger in the mainland non-agricultural regions and especially in Athens. Crucially, the high-unemployment regions during the crisis are not those that suffered the largest demand shock (as measured by the rise in 'baseline' unemployment risk) but rather those that displayed a relative disadvantage in matching efficiency (and, less so, in labour quality). Overall, problems of matching efficiency / valuation have been found to be an important part of the unemployment story in Greece. Especially in relation to education, our results suggest an important deficiency in the Greek labour market(s), as employment probabilities associated to education (years of schooling) appear particularly low (often not different from zero) and have increased only slightly during the crisis. A number of important conclusions can be derived from this.

First, high-unemployment regions – and perhaps the country as a whole – suffer from a relative over-education problem, meaning that education is over-supplied relative to the demand for skills and thus not sufficiently rewarded. In turn, this suggests two things. On the one hand, that the skill-content of jobs in Greece (both before and during the crisis) is rather low, showing a deficiency in the availability of 'good', high-productivity jobs. On the other hand, that the education system in Greece produces skills that are not directly marketable in the Greek labour market, showing a qualitative mismatch between skills demanded and skills produced.

Second, the extent of job-competition in the country is rather limited. Across space, both before and during the crisis, slack labour markets have been found to have low (or zero) penalties for unfavourable workforce characteristics. Unemployment risk coefficients have increased (in absolute terms) with the crisis, but compared to the size of the shock and the extent of depression of the economy, the increase is not particularly sizeable – suggesting that job-competition and bumping-down have intensified only to a limited extent. Although for some exogenous characteristics (gender, ethnicity) this may not be seen as a problem (especially as it may also be taken to imply low levels of labour market discrimination), for acquired characteristics (especially education) it rather signals a malfunctioning of the labour market, indicating that incentives for the accumulation of advantageous workforce characteristics – and the rewards for these – are also low.

Last but not least, intra-and inter-regional adjustment mechanisms in the country – perhaps with very few exceptions, mainly in the metropolitan areas – appear also particularly weak. As Figures 10-14 show, valuation differentials are sizeable and rather persistent; especially in the period before the crisis, they have been the main component accounting for unemployment differences across space. It follows that the responsiveness of labour supply (including through migration) to differences in unemployment risk is very low. This is most probably not unrelated to the various institutional rigidities in the country (including in the labour and housing markets), but it also reflects perhaps a more attitudinal source of rigidity that has to do with people's preferences (e.g., about locality) and the informal institutions associated to these (e.g., social networks, role of extended family, etc).

These observations have an important policy dimension. Identifying and understanding the specific conditions shaping unemployment risk at the individual and regional levels can help inform the design of relevant policies, including place-based ones, that will respond to the specific circumstances of each local labour market and its workforce. This is especially important for the depressed economy of Greece, where a demand-led exit from unemployment is quite unlikely. As an example, knowing that education does not 'pay' (in terms of employment probabilities) in regions such as Crete and the Peloponnese can direct policy – especially in the contemporary context of continuing austerity and private-sector disinvestment – towards actions that selectively attempt to diversify the skills of the better-educated in those regions or to increase their mobility (while pursuing in the longer-run a strategy to increase the demand for skills in these labour markets). Instead, knowing that education carries a very high premium in the regions of Thessaloniki and Western Macedonia ought to direct policy towards measures that seek to raise the educational qualifications – or the related labour market skills – of the local workforce and/or to attract educated workers into these regions. In a time of crisis and overall demand deficiency, finding the appropriate policy measures to tackle unemployment and, moreover, fine-tuning them across space and in response to specific labour market conditions is – needless to say – of paramount importance, not only in economic terms but also on social grounds. We believe that the range and character of the results unveiled in this paper make a small, but highly relevant contribution to this.

APPENDIX

Table A.1. Descriptive statistics

	2000		2004		2008		2012	
	E	U	E	U	E	U	E	U
Education	11.380	11.909	11.895	12.122	12.228	12.264	12.603	12.327
	(0.930)	(0.470)	(0.844)	(0.704)	(0.866)	(0.845)	(0.897)	(0.552)
Female	0.379	0.611	0.387	0.639	0.397	0.637	0.412	0.513
	(0.028)	(0.067)	(0.021)	(0.049)	(0.024)	(0.044)	(0.021)	(0.037)
Foreign	0.034	0.034	0.056	0.053	0.073	0.070	0.068	0.104
	(0.019)	(0.015)	(0.025)	(0.027)	(0.032)	(0.043)	(0.030)	(0.041)
Hhold size	3.440	3.633	3.298	3.560	3.212	3.412	3.183	3.401
	(0.144)	(0.264)	(0.135)	(0.145)	(0.149)	(0.232)	(0.189)	(0.205)
Married	0.689	0.379	0.689	0.454	0.661	0.432	0.679	0.455
	(0.032)	(0.075)	(0.041)	(0.055)	(0.039)	(0.093)	(0.038)	(0.064)
Age 16-24	0.095	0.317	0.084	0.264	0.063	0.205	0.040	0.158
	(0.017)	(0.063)	(0.013)	(0.036)	(0.012)	(0.053)	(0.010)	(0.035)
Age 25-34	0.262	0.365	0.254	0.341	0.233	0.358	0.213	0.323
	(0.029)	(0.057)	(0.022)	(0.051)	(0.029)	(0.058)	(0.028)	(0.034)
Age 35-44	0.243	0.108	0.245	0.121	0.263	0.150	0.289	0.192
	(0.018)	(0.033)	(0.015)	(0.040)	(0.019)	(0.037)	(0.020)	(0.032)
Age 45-54	0.267	0.173	0.289	0.230	0.291	0.227	0.295	0.255
	(0.016)	(0.029)	(0.014)	(0.039)	(0.025)	(0.061)	(0.028)	(0.029)
Age 55-64	0.134	0.037	0.128	0.045	0.149	0.060	0.163	0.073
	(0.031)	(0.011)	(0.022)	(0.015)	(0.029)	(0.014)	(0.027)	(0.025)
Unempl rate	0.112		0.106		0.076		0.235	
	0.259		*0.245*		*0.263*		*0.179*	

Notes: Average (nation-wide) values by year and employment status (E – employed; U – unemployed). Figures in parentheses give the standard deviation of the regional distribution of each variable for the particular year-group. Figures in Italics give the coefficient of variation of the distribution of regional unemployment.

Table A.2. Marginal effects from region-specific probit regressions (2000)

VARIABLES	*East Macedonia & Thrace*	*Rest of Central Macedonia*	*West Macedonia*	*Ipeiros*	*Thessaly*	*Ionian*	*West Greece*	*Continental Greece*	*Rest of Attica*	*Peloponnese*	*North Aegean*	*South Aegean*	*Crete*	*Athens*	*Thessaloniki*
Education	0.162	0.0833	-0.819**	-0.240	-0.451**	0.214	0.324*	-0.622***	-0.311	0.178	-0.795***	-0.000718	-0.0162	-0.883***	-0.754***
	(0.166)	(0.183)	(0.330)	(0.220)	(0.216)	(0.245)	(0.177)	(0.241)	(0.206)	(0.188)	(0.285)	(0.262)	(0.159)	(0.103)	(0.162)
Female	5.973***	11.28***	10.52***	10.99***	16.67***	2.316	7.862***	13.69***	9.290***	9.989***	9.205***	4.944***	7.575***	7.953***	7.717***
	(1.197)	(1.251)	(2.027)	(1.525)	(1.438)	(1.749)	(1.282)	(1.529)	(1.355)	(1.307)	(1.961)	(1.552)	(1.182)	(0.674)	(1.077)
Foreign	9.080**	8.568	11.88	0.000	4.461	2.158	-6.175	-2.785	-10.56***	3.131	19.38**	1.388	2.895	-0.647	-5.041
	(4.115)	(5.305)	(9.298)	(0.000)	(5.588)	(5.700)	(5.170)	(6.573)	(3.718)	(3.772)	(9.314)	(4.771)	(3.010)	(1.422)	(3.274)
Hhold size	0.554	-0.809	-0.644	1.678**	0.423	1.067	1.419***	0.940	1.590***	-0.0534	0.645	1.956***	0.182	1.060***	0.781
	(0.489)	(0.512)	(0.915)	(0.654)	(0.553)	(0.771)	(0.462)	(0.604)	(0.477)	(0.541)	(0.752)	(0.689)	(0.427)	(0.287)	(0.483)
Married	-4.878***	-6.577***	-1.953	-6.468***	-8.231***	-5.215**	-8.666***	-4.733**	-8.691***	-5.014***	-6.494***	-3.380	-4.981***	-8.224***	-9.953***
	(1.556)	(1.619)	(2.694)	(2.109)	(1.772)	(2.131)	(1.567)	(2.011)	(1.772)	(1.737)	(2.250)	(2.189)	(1.429)	(0.806)	(1.385)
Age 16-24	7.805***	10.90***	23.55***	11.33***	10.36***	2.716	12.78***	18.18***	6.851***	11.49***	3.559	7.675**	7.030***	11.12***	8.727***
	(2.207)	(2.115)	(3.715)	(2.998)	(2.546)	(3.081)	(2.087)	(2.644)	(2.364)	(2.416)	(2.983)	(3.134)	(1.903)	(1.186)	(1.907)
Age 25-34	5.568***	4.588***	7.623***	7.208***	6.646***	6.050**	5.527***	7.327***	0.229	4.164**	3.616	4.629*	1.193	5.918***	4.207***
	(1.768)	(1.766)	(2.785)	(2.344)	(2.045)	(2.430)	(1.803)	(2.278)	(1.985)	(1.893)	(2.458)	(2.693)	(1.639)	(0.939)	(1.555)
Age 45-54	1.390	-4.670**	-5.450	-2.323	-4.547*	-2.064	-1.699	-5.155*	-3.081	-1.140	-6.510*	1.384	-5.310**	-1.287	-0.704
	(1.936)	(2.202)	(3.477)	(2.560)	(2.549)	(3.240)	(2.285)	(2.690)	(2.241)	(2.081)	(3.911)	(3.026)	(2.221)	(1.107)	(1.721)
Age 55-64	-6.388**	-9.672***	-10.13**	-7.861**	-12.83***	-0.312	-4.323	-11.46***	-3.470	-9.379***	-10.98*	2.426	-10.03***	-0.648	-2.384
	(3.051)	(3.260)	(4.837)	(3.493)	(3.824)	(3.905)	(3.414)	(3.831)	(3.095)	(3.295)	(6.191)	(3.849)	(3.067)	(1.535)	(2.717)
Net u-risk	4.35***	8.77***	20.07***	4.87***	10.10***	1.37***	2.25***	10.08***	9.91***	4.99***	16.43**	0.49***	4.90***	18.51***	19.49***
Pseudo-R^2	0.087	0.179	0.130	0.151	0.194	0.128	0.188	0.176	0.118	0.139	0.171	0.135	0.158	0.102	0.112
Obs	2,186	2,201	1,093	1,558	1,869	755	2,191	1,800	2,108	2,006	702	960	2,079	8,956	3,375

Notes: Marginal effects (multiplied by 100 / expressed in percentage points) calculated on average sample values (standard errors in parentheses). 'Net unemployment risk' is the cumulative probability (one-sided) of the standard normal distribution associated to the corresponding fixed effect (see text for details). *, ** and *** show significance at 10%, 5% and 1%, respectively.

Table A.3. Marginal effects from region-specific probit regressions (2004)

VARIABLES	*East Macedonia & Thrace*	*Rest of Central Macedonia*	*West Macedonia*	*Ipeiros*	*Thessaly*	*Ionian*	*West Greece*	*Continental Greece*	*Rest of Attica*	*Peloponnese*	*North Aegean*	*South Aegean*	*Crete*	*Athens*	*Thessaloniki*
Education	-0.214	0.140	-1.649***	-0.0137	0.223	-0.314	-0.0701	-0.613***	-0.261	-0.215	-0.566*	-0.401	-0.176	-0.558***	-0.371**
	(0.198)	(0.201)	(0.324)	(0.187)	(0.185)	(0.338)	(0.187)	(0.223)	(0.161)	(0.163)	(0.307)	(0.266)	(0.144)	(0.117)	(0.170)
Female	13.77***	12.65***	14.81***	9.913***	10.36***	6.910***	13.17***	11.58***	5.757***	9.959***	15.01***	7.334***	5.292***	7.256***	9.637***
	(1.379)	(1.345)	(2.028)	(1.260)	(1.295)	(2.245)	(1.332)	(1.393)	(1.074)	(1.133)	(2.073)	(1.786)	(0.973)	(0.755)	(1.065)
Foreign	-15.61**	0.563	0.850	2.122	-2.163	9.530**	4.095	-3.641	-3.268	0.636	-0.672	2.184	-2.065	-2.064	0.849
	(6.894)	(3.484)	(8.591)	(3.036)	(3.354)	(4.306)	(3.434)	(3.669)	(1.990)	(2.471)	(5.907)	(4.840)	(2.644)	(1.302)	(2.235)
Hhold size	1.129*	1.802***	1.175	1.289***	0.693	0.0716	0.791	2.170***	1.096**	0.600	2.658***	1.820**	0.811**	0.820***	2.825***
	(0.641)	(0.537)	(0.878)	(0.481)	(0.512)	(0.879)	(0.508)	(0.591)	(0.443)	(0.422)	(0.922)	(0.715)	(0.391)	(0.307)	(0.467)
Married	-5.657***	-6.183***	-6.738**	-7.594***	-5.430***	-5.956**	-7.096***	-9.619***	-4.553***	-3.740***	-9.232***	-8.978***	-3.679***	-3.770***	-7.568***
	(1.831)	(1.727)	(2.810)	(1.584)	(1.571)	(2.707)	(1.622)	(1.740)	(1.294)	(1.444)	(2.451)	(2.167)	(1.190)	(0.876)	(1.277)
Age 16-24	8.540***	14.58***	21.28***	13.94***	10.24***	6.760*	9.936***	8.026***	7.490***	12.07***	4.834	3.186	5.533***	6.891***	7.812***
	(2.585)	(2.462)	(3.796)	(2.288)	(2.380)	(4.107)	(2.401)	(2.440)	(1.915)	(1.951)	(3.645)	(3.260)	(1.622)	(1.292)	(1.788)
Age 25-34	0.989	8.605***	4.815*	6.301***	6.196***	-1.573	6.021***	3.389*	4.329***	4.252***	3.200	3.067	1.650	1.018	2.717*
	(1.847)	(1.858)	(2.820)	(1.831)	(1.780)	(3.178)	(1.866)	(1.894)	(1.530)	(1.553)	(2.508)	(2.517)	(1.276)	(0.988)	(1.403)
Age 45-54	-5.204**	-0.426	-14.31***	2.135	-0.473	0.341	-3.100	-5.252**	-0.920	-1.720	1.320	-0.645	-5.710***	-3.708***	-5.631***
	(2.099)	(2.209)	(3.746)	(2.021)	(1.995)	(3.205)	(2.132)	(2.206)	(1.748)	(1.724)	(3.212)	(2.840)	(1.657)	(1.144)	(1.730)
Age 55-64	-12.33***	-1.154	-6.426	-0.854	-3.560	-7.038	-5.277	-4.870	0.868	-6.681**	-5.997	-1.360	-11.70***	-2.780*	-3.326
	(3.343)	(3.061)	(4.363)	(2.825)	(2.921)	(4.974)	(3.428)	(3.177)	(2.257)	(2.825)	(5.921)	(3.767)	(3.230)	(1.613)	(2.460)
Net u-risk	9.59***	2.44***	32.03*	4.63***	2.94***	13.81***	6.11***	11.55***	5.66***	4.61***	4.01***	7.64***	5.72***	13.22***	6.23***
Pseudo-R^2	0.116	0.145	0.175	0.127	0.125	0.073	0.132	0.129	0.081	0.145	0.196	0.104	0.114	0.069	0.120
Obs	2,268	2,057	1,037	2,519	2,155	741	2,224	2,041	2,611	2,550	758	963	2,759	6,200	3,484

Notes: See notes in Table A.2.

Table A.4. Marginal effects from region-specific probit regressions (2008)

VARIABLES	*East Macedonia & Thrace*	*Rest of Central Macedonia*	*West Macedonia*	*Ipeiros*	*Thessaly*	*Ionian*	*West Greece*	*Continental Greece*	*Rest of Attica*	*Peloponnese*	*North Aegean*	*South Aegean*	*Crete*	*Athens*	*Thessaloniki*
Education	-0.261	-0.306	-0.836***	-0.439**	0.153	-0.781**	-0.257	-0.481**	-0.628***	0.0379	-0.403	-0.366	0.0702	-0.289***	-0.699***
	(0.174)	(0.193)	(0.317)	(0.185)	(0.193)	(0.349)	(0.191)	(0.216)	(0.159)	(0.174)	(0.279)	(0.236)	(0.137)	(0.0968)	(0.169)
Female	9.478***	7.791***	12.16***	12.57***	6.444***	8.370***	9.070***	8.210***	6.736***	8.288***	7.101***	6.775***	5.032***	3.369***	7.915***
	(1.308)	(1.317)	(2.170)	(1.310)	(1.339)	(2.320)	(1.359)	(1.335)	(1.028)	(1.203)	(1.889)	(1.747)	(0.981)	(0.618)	(1.121)
Foreign	1.291	0.836	7.681	2.380	1.912	1.028	2.780	-3.371	-4.199**	-1.249	6.324**	0.366	-0.484	-1.955*	-2.907
	(3.052)	(3.277)	(7.200)	(2.736)	(3.474)	(3.752)	(3.997)	(2.626)	(1.905)	(2.289)	(2.683)	(3.518)	(1.998)	(1.045)	(1.949)
Hhold size	0.514	0.774	1.738**	1.116**	0.779	1.652*	0.918*	1.603***	0.775*	0.351	0.781	-0.352	-0.0482	0.740***	-0.0237
	(0.625)	(0.554)	(0.727)	(0.554)	(0.474)	(0.908)	(0.473)	(0.499)	(0.410)	(0.539)	(0.603)	(0.770)	(0.429)	(0.263)	(0.487)
Married	-4.188**	-3.125*	-7.942***	-3.748**	-7.568***	-3.575	-9.630***	-5.422***	-3.089**	-4.810***	-3.545*	-2.878	-2.264*	-5.003***	-1.645
	(1.636)	(1.634)	(2.859)	(1.596)	(1.529)	(2.844)	(1.578)	(1.633)	(1.242)	(1.423)	(1.899)	(2.137)	(1.174)	(0.804)	(1.361)
Age 16-24	7.784***	8.962***	9.969**	11.96***	4.923**	11.58***	10.56***	8.302***	5.403***	6.795***	4.324	3.437	3.688**	6.459***	8.385***
	(2.554)	(2.474)	(4.361)	(2.394)	(2.462)	(4.189)	(2.162)	(2.567)	(1.908)	(2.099)	(3.155)	(3.566)	(1.838)	(1.121)	(2.132)
Age 25-34	6.146***	3.075*	2.811	5.703***	2.136	1.937	2.971*	4.078**	3.788***	3.149**	2.986	1.294	0.930	3.062***	5.733***
	(1.837)	(1.784)	(3.039)	(1.693)	(1.764)	(3.506)	(1.804)	(1.876)	(1.432)	(1.503)	(2.137)	(2.425)	(1.340)	(0.868)	(1.445)
Age 45-54	2.723	-3.627*	-4.648	-4.127**	1.948	0.0629	-2.055	-2.585	-0.944	-4.798***	-1.164	2.080	-0.973	-0.812	-5.656***
	(1.886)	(1.944)	(3.036)	(1.872)	(1.908)	(3.047)	(2.149)	(1.901)	(1.547)	(1.831)	(2.861)	(2.472)	(1.432)	(0.965)	(1.726)
Age 55-64	-1.656	-4.206	-3.835	-6.677**	-0.127	-6.218	-1.132	-4.961*	-3.346	-5.966**	-2.278	-5.619	-2.026	0.160	-4.110*
	(2.869)	(2.650)	(4.151)	(2.652)	(2.485)	(4.362)	(2.987)	(2.633)	(2.243)	(2.644)	(3.429)	(3.604)	(1.746)	(1.272)	(2.252)
Net u-risk	5.06***	6.51***	15.34***	4.87***	3.49***	8.24***	7.31***	6.48***	9.87***	4.41***	3.33***	11.39***	3.80***	6.94***	16.01***
Pseudo-R^2	0.088	0.095	0.106	0.161	0.086	0.124	0.160	0.128	0.087	0.128	0.224	0.056	0.049	0.086	0.089
Obs	1,964	1,732	957	2,147	1,745	664	1,886	1,766	2,633	2,157	615	864	2,493	5,958	2,982

<u>Notes:</u> See notes in Table A.2.

Table A.5. Marginal effects from region-specific probit regressions (2012)

VARIABLES	*East Macedonia & Thrace*	*Rest of Central Macedonia*	*West Macedonia*	*Ipeiros*	*Thessaly*	*Ionian*	*West Greece*	*Continental Greece*	*Rest of Attica*	*Peloponnese*	*North Aegean*	*South Aegean*	*Crete*	*Athens*	*Thessaloniki*
Education	-0.897***	-1.284***	-1.711***	-1.602***	-1.102***	-0.661*	-0.348	-0.917**	-0.545	-0.382	-1.383***	-0.407	-0.928***	-2.341***	-2.544***
	(0.242)	(0.291)	(0.493)	(0.324)	(0.306)	(0.397)	(0.277)	(0.364)	(0.376)	(0.288)	(0.531)	(0.523)	(0.276)	(0.213)	(0.290)
Female	6.047***	8.914***	13.12***	8.316***	14.47***	8.953***	6.788***	14.93***	9.327***	10.91***	12.97***	7.132**	9.319***	3.185**	8.649***
	(1.986)	(2.005)	(2.920)	(2.138)	(1.952)	(2.611)	(1.979)	(2.217)	(2.371)	(1.737)	(3.276)	(3.498)	(1.899)	(1.358)	(1.926)
Foreign	26.94***	8.565*	6.169	-3.086	-3.171	7.673	7.490*	0.542	13.27***	6.056**	17.90**	15.25**	12.60***	1.204	13.20***
	(5.161)	(4.592)	(9.036)	(5.166)	(5.206)	(4.690)	(4.504)	(4.094)	(4.266)	(3.078)	(7.651)	(6.374)	(3.197)	(2.326)	(4.089)
Hhold size	4.176***	3.027***	0.153	1.803**	0.499	1.802	2.892***	3.227***	2.593***	3.214***	7.312***	4.605***	0.303	2.543***	1.902**
	(0.757)	(0.852)	(1.261)	(0.870)	(0.800)	(1.102)	(0.776)	(1.014)	(0.953)	(0.787)	(1.672)	(1.433)	(0.820)	(0.635)	(0.885)
Married	-11.33***	-12.86***	-7.558*	-9.114***	-11.14***	-3.311	-16.11***	-14.65***	-15.63***	-13.84***	-12.08***	-4.531	-13.30***	-12.24***	-12.16***
	(2.434)	(2.529)	(3.869)	(2.624)	(2.526)	(3.320)	(2.470)	(2.699)	(2.956)	(2.122)	(4.656)	(5.101)	(2.302)	(1.602)	(2.313)
Age 16-24	16.78***	21.25***	34.18***	27.88***	18.56***	5.051	21.24***	14.95***	14.42***	23.29***	11.08	14.33*	10.57***	15.55***	18.45***
	(3.959)	(4.122)	(6.749)	(4.210)	(4.202)	(5.510)	(3.954)	(4.536)	(4.663)	(3.583)	(6.957)	(8.430)	(3.702)	(2.786)	(4.398)
Age 25-34	7.726***	5.767**	9.780**	12.37***	8.324***	1.203	9.163***	4.260	-0.158	9.342***	3.174	0.684	6.249**	5.461***	8.502***
	(2.772)	(2.855)	(4.077)	(2.924)	(2.775)	(3.879)	(2.830)	(3.130)	(3.537)	(2.441)	(5.072)	(5.065)	(2.577)	(1.861)	(2.612)
Age 45-54	-4.961*	-2.194	-11.59***	-2.831	-5.220*	-3.248	2.637	-5.489	-2.614	-4.908*	-7.805*	6.545	-5.826**	-0.0211	-5.370**
	(2.871)	(2.794)	(4.165)	(3.092)	(2.771)	(3.491)	(2.814)	(3.353)	(3.290)	(2.555)	(4.690)	(5.046)	(2.682)	(1.847)	(2.568)
Age 55-64	-8.752**	-9.518**	-19.61***	-14.35***	-23.49***	-13.28***	-2.571	-14.03***	-4.564	-6.155*	-5.145	6.261	-9.844***	-3.631	-3.919
	(3.670)	(3.910)	(5.937)	(3.867)	(4.455)	(4.870)	(3.746)	(4.871)	(4.461)	(3.217)	(6.298)	(5.608)	(3.694)	(2.487)	(3.409)
Net u-risk	22.18***	30.89***	53.04	36.54	36.92	15.48***	19.0***	31.70**	29.05**	12.63***	15.32***	6.15***	38.44*	60.18*	64.88**
Pseudo-R^2	0.101	0.098	0.107	0.122	0.136	0.060	0.091	0.106	0.067	0.173	0.137	0.062	0.079	0.076	0.088
Obs	1,800	1,638	874	1,674	1,726	745	1,857	1,565	1,623	1,805	586	497	2,046	4,443	2,178

Notes: See notes in Table A.2.

Table A.6. Region groupings for the decompositions

Region	*Agricul-tural*	*Island*	*North*	*Above-average unemployment*			
				2000	*2004*	*2008*	*2012*
East Mac. & Thrace	X		X		X	X	X
Central Macedonia	X		X		X	X	
West Macedonia			X	X	X	X	X
Ipeiros			X		X	X	
Thessaly	X		X	X		X	
Ionian		X			X	X	
Western Greece	X				X	X	X
Continental Greece	X			X	X	X	X
Attica				X			X
Peloponnese	X					X	
North Aegean		X	X				
South Aegean		X					
Crete		X					
Athens				X			
Thessaloniki			X	X	X	X	X

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