REGIONAL EMPLOYMENT IN PORTUGAL: DIFFERENCES AND CYCLICAL SYNCHRONISATION

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Abstract

This paper analyses the specificities of employment in Portuguese regions at a disaggregated level of NUTS III, comparing the differences of several indicators between the last two censuses. It also examines the synchronisation of regional employment cycles over the 2000-2014 period, using the information provided for the new nomenclature of NUTS. The comparison of several employment's characteristics (total and by sex, age group, sector of activity and main occupation) across the 7 regions and 25 sub-regions allowed us to conclude that Portugal is marked by substantial regional specificities. The analysis of the evolution of employment 'cycles highlight the substantial reduction in the employment rate since the beginning of the 2000s, with particular intensity in the period of the recent crisis, and considerable differences across regions and at the intraregional level. The results from the synchronisation reveal a great heterogeneity in the degree of correlation between the sub-national cycles and the national cycle. Additionally, they suggest that, in general, the cyclical pattern of the sub-regions is more closely related to the regions that they belong to than that of the Portuguese cycle. The paper concludes that this heterogeneity should be addressed in the context of policy making, by means to construct appropriate responses to counteract the regional differences.

Keywords: employment, disparities, cycles, Portuguese regions
JEL classification: E32, J21, R11, R12

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1. Introduction

The Portuguese labour market has experienced substantial changes since the beginning of this century. One of the most distinctive features has been the significant reduction in employment, such that in 2014 the number of persons employed was substantially below those registered in 2000 (about 11%).

This negative evolution of employment follows recent behaviour in the European Union (EU) where, since the onset of the recent crisis, much of the progress made in terms of employment convergence between European Member States has been reversed. Indeed, while economic output and employment have both experienced signs of recovery in 2014, they remain below the pre-crisis levels and the economic recovery remains fragile (European Commission, 2015). According to data from Eurostat, in 2014 the employment rate in the EU-28 was 52%, 23 percentage points (p.p.) below the objective of the Europe 2020 strategy (75%). Looking at the current situation and considering the slight expected increase in employment in the coming years, that objective will barely be achieved in EU. Considering

the figure of 51% for the employment rate in 2014 it is also very unlikely that Portugal will be able to achieve the desired goal.

The great crisis that affected Europe from 2008 onward had extremely adverse consequences for European labour markets. Of all EU State members, the southern European countries were most affected by the crisis (Gutiérrez, 2014). In Portugal, there had been a deterioration of conditions in the labour market since the beginning of this century. Many companies went bankrupt in the 2000s, there were low growth rates and two recessions, factors that are associated with the destruction/low creation of jobs and an increase in the level and duration of unemployment (Correia, 2016). The recent crisis and the larger package of austerity measures agreed between Portuguese authorities and Troika, in the context of Economic and Financial Assistance Programme (2011-2014), worsened the problems in labour market.

The situation at national level does not necessarily reflect the situation of all Portuguese regions and sub-regions. In fact, substantial literature claims that despite being a small country, Portugal is characterized by large regional disparities. Several authors (e.g. Guerreiro and Caleiro, 2005; Correia and Gouveia, 2013), applying different concepts and methodologies, recognise the great heterogeneity in the territory, namely in terms of economic context.

An analysis of the distribution of employment in Portuguese territory is justified by its substantial impact on the income and purchasing power of regions, influencing the well-being of population. In particular, employment may be responsible for the geographical distribution of the population in the territory. A better understanding of the regional evolution of employment could, among other effects, support the adoption of more appropriate employment policies and then promote the development and cohesion of territories.

In this context, our study aims to improve knowledge about the regional specificities of employment in Portugal, taking into account aspects such as the distribution of employment by sex, age group, sector of activity and main occupation. To achieve this goal, we examine the differences in these indicators across the Portuguese territories taking the most recent information after the beginning of this century, which is provided by the last two censuses (2001 and 2011).

Another important issue to explore is the cyclical synchronisation of regional employment. The business cycle synchronisation has been examined in the literature, mainly at national level. Specifically, as regards the Portuguese case, studies of synchronisation at regional level are scarce, a noteworthy example being the analysis conducted by Correia and Gouveia (2013) for the product per capita of the Portuguese regions, over the period 1988-2010. They found considerable regional asymmetries in the amplitude and degree of association of regional business cycles and concluded the existence of a regional border effect.

In section three we focus specifically on the association between the cycles of regional employment for the 2000-2014 period. Data availability is according to the new version of the Nomenclature of Territorial Units for Statistical Purposes (NUTS), available after 2015. This new regional division (NUTS 2013), compared to the previous version, translates into significant changes in the number and municipal composition of NUTS III, from 30 to 25 territorial units, now designated “administrative units”. In this context, in addition to the relevance of the problem analysed in this paper, another interesting contribution of this study builds on an exploration of the dataset recently published by National Statistics Office (INE) concerning the new classification of Portuguese NUTS that, as far we known, has not yet been examined in earlier studies.

This paper is organised as follows. The second section presents and compares some facts that characterised the evolution of regional employment between the censuses of 2001 and 2011. The third section reports on a study of the synchronisation of regional employment cycles since the beginning of the 2000s. The fourth section concludes the paper, presenting the main results and policy recommendations.

2. Characterisation of regional employment: some indicators

The new regional division (NUTS 2013) groups the 308 Portuguese municipalities into 3 NUTS I, 7 NUTS II and 25 NUTS III (Table 1).

Table 1. Nomenclature of Territorial Units for Statistical Purposes – 2013 version (NUTS 2013)

NUTS 2013	NUTS I	NUTS II	NUTS III
Portugal	Continente	Norte	Alto Minho
			Cávado
			Ave
			Área Metropolitana do Porto
			Alto Tâmega
			Tâmega e Sousa
			Douro
			Terras de Trás-os-Montes
		Centro	Região de Aveiro
			Região de Coimbra
			Região de Leiria
			Viseu Dão Lafões
			Beiras e Serra da Estrela
			Beira Baixa
			Oeste
			Médio Tejo
		Área Metropolitana de Lisboa	Área Metropolitana de Lisboa
		Alentejo	Alentejo Litoral
			Alto Alentejo
			Alentejo Central
			Baixo Alentejo
			Lezíria do Tejo
		Algarve	Algarve
	Região Autónoma dos Açores	Região Autónoma dos Açores	Região Autónoma dos Açores
	Região Autónoma da Madeira	Região Autónoma da Madeira	Região Autónoma da Madeira

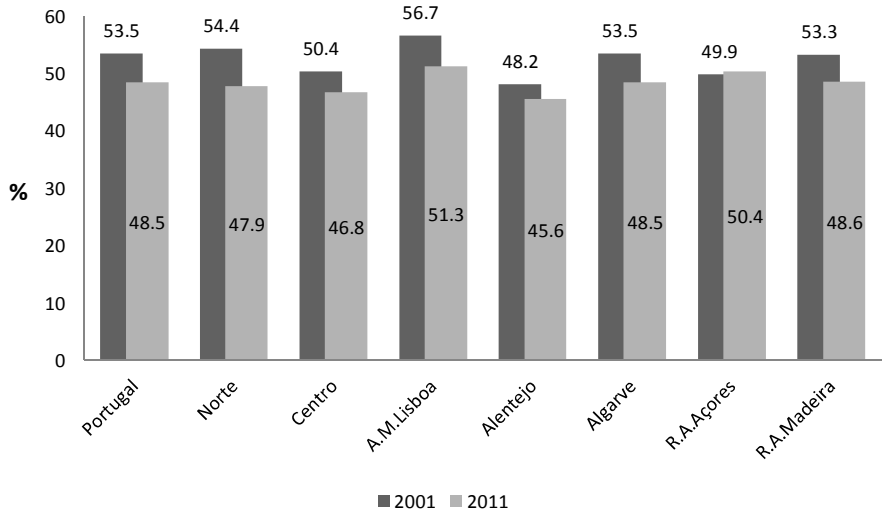
Source: INE (2015)

The remaining of this section contains a synthetic characterisation of registered employment in these Portuguese regions, disaggregated to the NUTS III level, looking at the evolution of employment rate: in total and by sex, by age group, by economic sector and by occupational status. The original source of these indicators is INE and they are available on the Database of Contemporary Portugal (PORDATA) site (www.pordata.pt). Our analysis focuses on the years 2001 and 2011, the two censuses of the twenty-first century.

2.1. Employment total and by sex

A substantial decrease in employment in the Portuguese labour market is clearly visible in Figure 1.

Figure 1: Employment rate in Portugal and NUTS II, total, 2001 and 2011 (%)



Source of data: PORDATA

The Portuguese rate of employment fell 5 p.p. between the two censuses, corresponding to a decrease of approximately 290,000 persons employed. This behaviour is also seen in the NUTS II regions, with the exception of Açores where the rate of employment grew slightly. Norte had the highest decrease (6.5 p.p.). Comparing employment across regions, Lisboa stands out with the highest value, clearly above the average, while Alentejo is in the latest position. In 2011, there was a differential of 5.7 p.p. in the rate of employment in these two regions.

The Portuguese labour market is characterised by substantial gender inequality, the employment rate for men being considerably higher than for women (Figure 2).

Figure 2: Employment rate in Portugal and NUTS II, by sex, 2001 and 2011 (%)

(a) Male

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(b) Female

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Source of data: PORDATA

This discrepancy has been narrowing, however, because the male employment rate has decreased more than that for females, which has been important in some regions. In 2011, no region had male employment rates above that registered in Açores, and Lisboa had the highest female employment rate; the first region had a greater difference between the two genders (15 p.p.) and the second region a lesser difference (5.8 p.p.).

Gender inequality in the employment rate is seen in several other countries of the EU. As documented by Tavora (2012), the participation of women in the labour market is particularly low in the southern European countries, with the exception of Portugal, especially in the case of women with low education levels.

It should also be noted that the recent crisis seems to have affected more men than women. This seems to be related to the fact that, in general, women are concentrated in jobs in the

public and administrative sector and in services that have showed a smaller decrease (Bettio et al., 2012; Signorelli et al., 2012; Cho and Newhouse, 2013), while men are focused more in sectors that have fallen further, in particular construction and manufacturing (Bettio et al., 2012; Bank of Portugal, 2014).

From the analysis of the evolution of employment rates at the intra-regional level (Table 2) we conclude that the sub-regions experienced a decrease in the total employment rate, Alentejo Litoral being the exception. The Norte sub-regions present the greatest average and, simultaneously, higher heterogeneity in terms of variation in the employment rate.

Table 2. Employment rate of NUTS III, total and by sex, 2001 and 2011 (%; p.p.)

NUTS	Total			Male			Female		
	2001	2011	Δ	2001	2011	Δ	2001	2011	Δ
Norte									
Alto Minho	45.6	43.2	-2.4	57.1	50.5	-6.6	35.9	37.0	1.1
Cávado	57.5	51.8	-5.7	66.4	58.0	-8.5	49.4	46.3	-3.1
Ave	59.3	50.0	-9.3	66.9	55.2	-11.7	52.2	45.2	-7.0
Á. Metropolitana do Porto	57.4	49.2	-8.2	66.1	54.7	-11.5	49.4	44.3	-5.1
Alto Tâmega	38.6	35.7	-2.9	51.6	43.9	-7.7	26.4	28.4	2.0
Tâmega e Sousa	54.8	48.2	-6.6	68.9	57.7	-11.3	41.3	39.4	-1.9
Douro	42.9	41.8	-1.0	n.d.	49.7	n.d.	n.d.	34.8	n.d.
Terras de Trás-os-Montes	40.4	39.4	-1.0	51.6	45.6	-6.0	29.8	33.7	3.8
Mean	**49.6**	**44.9**	**-4.6**	**61.2**	**51.9**	**-9.0**	**40.6**	**38.6**	**-1.5**
Standard deviation	**8.0**	**5.4**	**3.2**	**7.0**	**5.0**	**2.4**	**9.5**	**5.9**	**3.9**
Centro									
Oeste	53.3	49.5	-3.8	63.8	55.2	-8.6	43.3	44.2	0.9
Região de Aveiro	55.9	50.6	-5.3	65.5	56.5	-9.0	47.1	45.3	-1.8
Região de Coimbra	50.1	47.1	-3.0	59.0	51.8	-7.1	42.3	43.0	0.8
Região de Leiria	53.9	49.5	-4.4	64.2	55.4	-8.8	44.4	44.2	-0.3
Viseu Dão Lafões	46.5	43.9	-2.6	58.2	50.8	-7.4	36.0	37.8	1.9
Beira Baixa	43.3	40.9	-2.4	52.9	46.0	-6.8	34.6	36.4	1.7
Médio Tejo	47.7	44.6	-3.0	58.1	50.6	-7.6	38.1	39.4	1.2
Beiras e Serra da Estrela	45.4	40.9	-4.5	n.d.	46.6	n.d.	n.d.	35.9	n.d.
Mean	**49.5**	**45.9**	**-3.6**	**60.2**	**51.6**	**-7.9**	**40.8**	**40.8**	**0.6**
Standard deviation	**4.5**	**3.9**	**1.0**	**4.5**	**4.0**	**0.9**	**4.7**	**3.8**	**1.3**
Alentejo									
Alentejo Litoral	47.1	47.1	0.0	56.9	53.3	-3.6	37.4	41.0	3.6
Baixo Alentejo	43.5	43.0	-0.5	54.4	49.2	-5.2	33.1	37.2	4.1
Lezíria do Tejo	51.4	47.7	-3.8	61.3	52.6	-8.7	42.3	43.2	0.8
Alto Alentejo	44.8	41.2	-3.6	54.0	45.9	-8.2	36.3	37.0	0.6
Alentejo Central	50.6	47.0	-3.6	59.9	52.1	-7.8	42.0	42.4	0.4
Mean	**47.5**	**45.2**	**-2.3**	**57.3**	**50.6**	**-6.7**	**38.2**	**40.2**	**1.9**
Standard deviation	**3.5**	**2.9**	**1.9**	**3.2**	**3.1**	**2.2**	**3.9**	**2.9**	**1.8**

Source of data: PORDATA Note: n.d. = no data available

Across the *Norte* subregions, *Ave* had the highest reduction, contrasting with the lowest variations presented by *Douro* and *Terras de Trás-os-Montes*. In 2011, *Cávado* reported the best figure, closely followed by *Ave* and *Área Metropolitana do Porto. Tâmega* and *Terras de*

Trás-os-Montes were the most distant sub-regions from the average. In the *Centro*, the *Região de Aveiro* stands out with the highest employment rate, and is also the sub-region with the greatest decrease. *Beira Baixa* and *Beiras e Serra da Estrela* are in the opposite position, and in 2011 had a differential of 9.7 p.p. from *Aveiro*. The sub-regions of *Alentejo* exhibit the lowest average decrease, *Lezíria do Tejo* being the sub-region with the best situation; however, in 2011, its employment rate was only 48%.

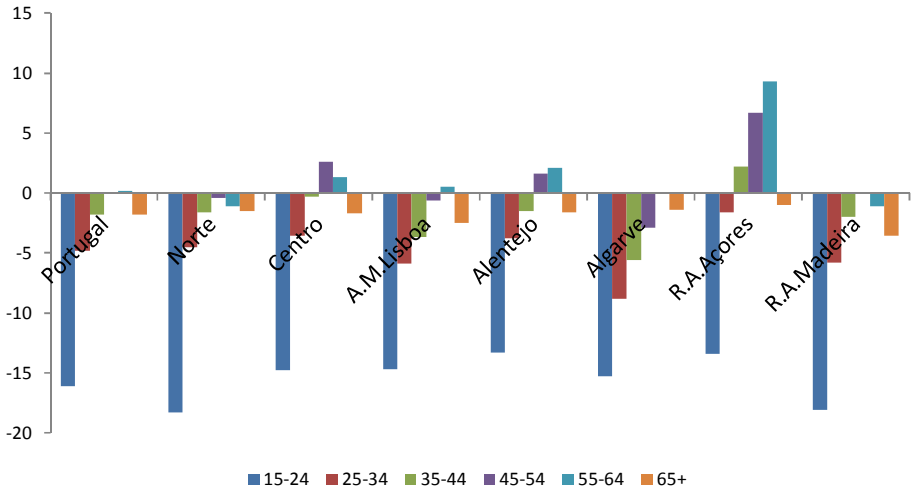
Gender inequality is visible in all sub-regions. As male employment decreased, however, the differential between the rate of employment for men and women also diminished between the two censuses. In 2011, the sub-regions of *Norte* showed, on average, the great difference and the sub-regions all had differentials in the two employment rates above 10 p.p. (*Ave*) and lower than 18.3 p.p. (*Tâmega e Sousa*). In the *Centro* sub-regions, the discrepancy varied between 8.8 p.p. (*Região de Coimbra*) and 13 p.p. (*Viseu Dão Lafões*). In the *Alentejo* sub-regions, employment rates for men and women were, on average, similar to those in *Centro*, with variation between 8.9 p.p. (*Alto Alentejo*) and 12.3 p.p. (*Alentejo Litoral*).

2.2. Employment by age group

An analysis of the employment rate by age reveals that, overall, the highest figures are found for ages between 25 and 54 years. The 65+ age group is, unsurprisingly, the most insignificant, reflecting the approach to retirement age. The changing employment rate over the 2001-2011 period (Figure 3), shows that youth were the most affected by worsening employment levels.

The employment rate for the 15-24 age group fell sharply in Portugal (16.1 p.p.) and in all regions, ranging between 13.3 p.p. in Alentejo and 18.3 p.p. in Norte. In the 25-34 age group there was also a decrease at national and regional levels, but this was less pronounced (a mean of 4.9 p.p.). The decrease, on average, was similar in the 35-44 and 65+ age groups (1.8 p.p. and 19.p.p, respectively). On average, the 45-54 years and 55-64 age groups had slight variations. The exception was Açores, which demonstrated significant growth in these two age groups (6.7 p.p. and 9.3 p.p., respectively).

Figure 3. Variation in employment rates by age, Portugal and NUTS II, 2001-2011 (p.p.)



Source of data: PORDATA

Concerning sub-regions (Table 3), we can also conclude that, in general, youth between 15 and 24 years were the more affected by the decrease in employment. The biggest decreases were in *Tâmega e Sousa*, *Cávado* and *Ave* (above 20 p.p.) in the *Norte*, in *Oeste*, *Região de Leiria* and *Região de Aveiro* (above 15 p.p.) in the *Centro* and in *Alto Alentejo, Lezíria do Tejo* and *Alentejo Central* (about 15 p.p.) in *Alentejo*.

All sub-regions saw a decrease in employment in the 25-34 age group but with much less intensity; on average, the figures vary between -1.9 p.p. and -3.4 p.p. in the sub-regions of *Norte* and *Alentejo,* respectively. There was also a decrease in the last group (65+) for all sub-

regions, relatively homogeneously across them. The 35-44 age group registered more oscillations across sub-regions. Almost the sub-regions exhibited a growth in employment in the two groups between 45 and 64 years.

Table 3. Variation in employment rate by age, NUTS III, 2001-2011 (p.p.)

NUTS III	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65+ years
Norte						
Alto Minho	-14.1	-0.3	3.2	4.6	1.5	-1.5
Cávado	-20.7	-4.3	-0.6	2.3	1.3	-1.0
Ave	-21.8	-5.8	-3.4	-2.5	-3.1	-1.4
Área Metropolitana do Porto	-18.4	-6.5	-3.7	-2.2	-3.2	-1.6
Alto Tâmega	-10.4	1.3	4.5	1.7	0.4	-2.0
Tâmega e Sousa	-23.0	-1.9	0.3	1.3	0.2	-1.4
Douro	-11.9	1.2	3.7	3.7	3.5	-1.3
Terras de Trás-os-Montes	-7.1	0.9	3.0	3.1	5.4	-2.1
Mean	**-15.9**	**-1.9**	**0.9**	**1.5**	**0.8**	**-1.5**
Standard deviation	**5.9**	**3.2**	**3.2**	**2.6**	**2.9**	**0.4**
Centro						
Oeste	-18.1	-3.9	-0.1	2.4	0.4	-1.3
Região de Aveiro	-15.8	-4.7	-1.5	1.1	-0.2	-1.7
Região de Coimbra	-12.8	-3.7	-0.2	3.8	2.4	-1.9
Região de Leiria	-17.2	-3.4	0.0	2.4	1.2	-1.2
Viseu Dão Lafões	-14.0	-0.2	3.7	3.6	-0.4	-1.9
Beira Baixa	-10.5	-1.9	-2.1	1.7	0.4	-2.6
Médio Tejo	-13.7	-2.8	-0.3	3.1	3.1	-1.8
Beiras e Serra da Estrela	-14.2	-6.1	-3.3	1.5	2.5	-1.5
Mean	**-14.5**	**-3.3**	**-0.5**	**2.5**	**1.2**	**-1.7**
Standard deviation	**2.4**	**1.8**	**2.1**	**1.0**	**1.3**	**0.4**
Alentejo						
Alentejo Litoral	-8.7	1.3	2.0	2.6	6.3	-1.7
Baixo Alentejo	-11.4	-1.5	-1.6	4.0	5.5	-0.8
Lezíria do Tejo	-14.7	-3.9	-0.9	1.2	-1.3	-1.8
Alto Alentejo	-14.8	-7.7	-4.0	0.4	1.5	-1.9
Alentejo Central	-14.6	-5.4	-3.3	0.6	2.0	-1.8
Mean	**-12.8**	**-3.4**	**-1.6**	**1.8**	**2.8**	**-1.6**
Standard deviation	**2.7**	**3.5**	**2.4**	**1.5**	**3.1**	**0.5**

Source of data: PORDATA

The greater decrease in employment for younger age groups than for older age groups (45+) could be partly explained by the coexistence of different contracts and protections in (un)employment for different groups of workers. A segmentation of the Portuguese labour market is seen in the growing incidence of fixed-term contracts, which mostly apply to youth and less experienced workers and, at the other end, by permanent jobs for more skilled and experienced workers (Centeno and Novo, 2012). Long term (permanent) jobs grew in the first decades after the establishment of the democratic regime (1974), whereas fixed-term contracts were introduced to Portugal in the 1980s. The rules for using fixed term contracts were made more flexible in the 1990s, contrasting with the protection afforded to permanent jobs, which hardly changed (Bank of Portugal, 2015).

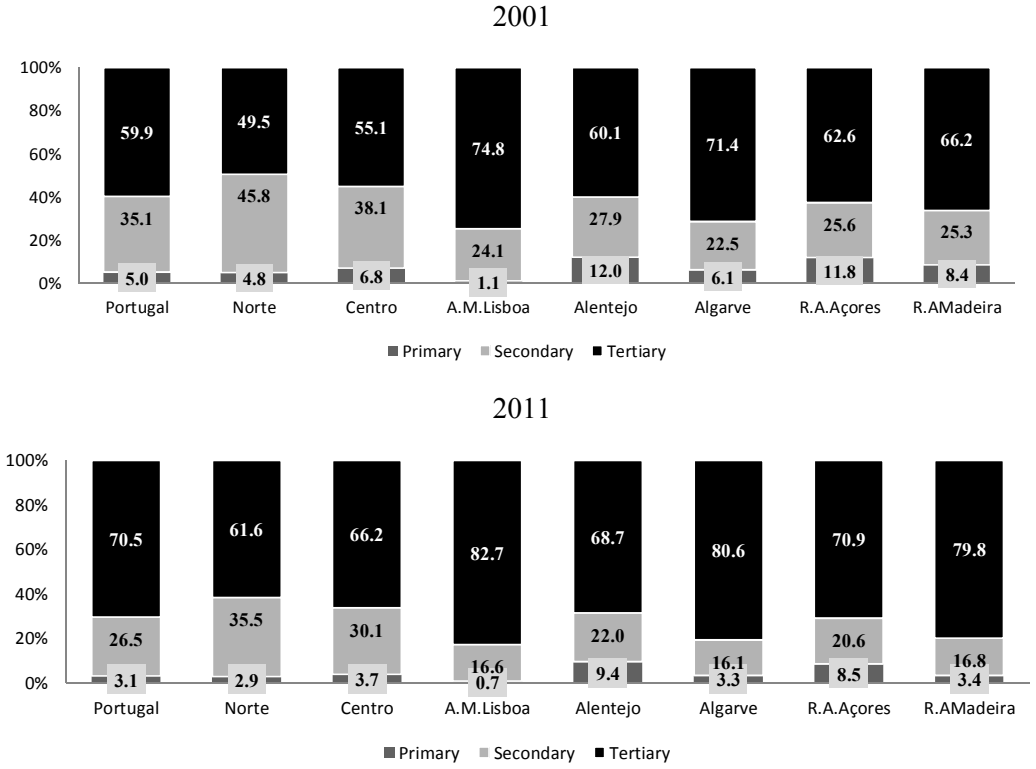
Another explanation is that the young have more difficulty accessing the labour market because their productivity is still difficult to assess, as they have little or no professional experience which implies a higher risk of incompatibility with an employer (Kahn, 2007; Dieckhoff and Steiber, 2012). Such reasons can explain, at least in part, why young people were the most affected by job losses during the recent economic crisis (European Commission, 2013).

2.3. Employment by sector of economic activity

The tertiary sector dominated employment in Portugal and its regions and was the only sector that grew from 2011 to 2011 (Figure 4). In both years, Lisboa presented the higher proportion of employment in the tertiary sector in contrast with the lowest percentage of Norte. The Região Autónoma da Madeira exhibited the greatest increase (13.6 p.p.).

The Norte, the more industrialized region, suffered the greatest decrease (10.3 p.p.) in the employment in the secondary sector. Almost all the regions have a small proportion of employment in the primary sector (below 12% and 9% registered by Alentejo in 2001 and 2011, respectively). The reduction experienced by the proportion of employment in this sector (below the 5 p.p. of Região Autónoma da Madeira) was, overall, lower than in the secondary sector.

Figure 4. Employment by sector of economic activity, Portugal and NUTS II, 2001-2011 (%)



Source of data: PORDATA

At the sub-regional level (Table 4) we can also conclude that the tertiary sector was the more important in terms of employment and the only sector where employment increased in the 2001-2011 period At the other extreme, the primary sector had the lowest proportion of employment in all sub-regions, but in some sub-regions of Norte (Alto Tâmega, Douro, Terras de Trás-os-Montes) and Alentejo (Alentejo Litoral and Baixo Alentejo) the figures were above 10% in 2011. It should also be noted that the reduction of employment in the primary sector was below that experienced by the secondary sector across most sub-regions.

Table 4. Employment by sector of economic activity, NUTS III, 2001 and 2011 (%; p.p.)

NUTS	Primary			Secondary			Tertiary		
	2001	2011	Δ	2001	2011	Δ	2001	2011	Δ
Norte									
Alto Minho	9.5	3.9	-5.6	40.7	34.8	-5.9	49.8	61.3	11.5
Cávado	4.0	2.4	-1.6	49.8	39.4	-10.4	46.2	58.2	12.0
Ave	2.7	1.5	-1.2	62.4	49.7	-12.7	34.8	48.8	14.0
Á. Metropolitana do Porto	1.8	1.3	-0.5	42.5	30.7	-11.8	55.7	68.0	12.3
Alto Tâmega	20.3	12.5	-7.8	26.0	22.0	-4.0	53.7	65.6	11.9
Tâmega e Sousa	5.0	2.5	-2.5	59.9	51.1	-8.8	35.2	46.5	11.3
Douro	21.0	14.2	-6.8	23.1	19.6	-3.5	55.9	66.3	10.4
Terras de Trás-os-Montes	19.2	10.8	-8.4	21.3	18.8	-2.5	59.6	70.4	10.8
Mean	**10.4**	**6.1**	**-4.3**	**40.7**	**33.3**	**-7.5**	**48.9**	**60.6**	**11.8**
Standard deviation	**8.4**	**5.4**	**3.2**	**16.2**	**12.9**	**4.0**	**9.5**	**8.9**	**1.1**
Centro									
Oeste	9.2	6.2	-3.0	36.7	27.1	-9.6	54.1	66.7	12.6
Região de Aveiro	4.6	2.6	-2.0	47.2	38.0	-9.2	48.2	59.4	11.2
Região de Coimbra	5.4	2.8	-2.6	31.5	24.9	-6.6	63.0	72.3	9.3
Região de Leiria	4.1	2.1	-2.0	45.8	37.6	-8.2	50.2	60.3	10.1
Viseu Dão Lafões	11.0	4.7	-6.3	34.7	28.9	-5.8	54.3	66.4	12.1
Beira Baixa	11.0	4.8	-6.2	32.2	25.5	-6.7	56.8	69.7	12.9
Médio Tejo	4.8	2.6	-2.2	34.9	28.5	-6.4	60.3	68.9	8.6
Beiras e Serra da Estrela	9.2	5.4	-3.8	37.3	26.1	-11.2	53.5	68.6	15.1
Mean	**7.4**	**3.9**	**-3.5**	**37.5**	**29.6**	**-8.0**	**55.1**	**66.5**	**11.5**
Standard deviation	**3.0**	**1.6**	**1.8**	**5.9**	**5.3**	**1.9**	**4.9**	**4.5**	**2.1**
Alentejo									
Alentejo Litoral	14.7	11.7	-3.0	27.8	24.8	-3.0	57.6	63.5	5.9
Baixo Alentejo	14.9	12.3	-2.6	22.7	18.8	-3.9	62.4	68.9	6.5
Lezíria do Tejo	10.0	7.3	-2.7	31.8	24.2	-7.6	58.2	68.5	10.3
Alto Alentejo	11.1	9.2	-1.9	25.2	18.5	-6.7	63.7	72.3	8.6
Alentejo Central	11.9	9.3	-2.6	27.9	21.3	-6.6	60.1	69.4	9.3
Mean	**12.5**	**10.0**	**-2.6**	**27.1**	**21.5**	**-5.6**	**60.4**	**68.5**	**8.1**
Standard deviation	**2.2**	**2.0**	**0.4**	**3.4**	**2.9**	**2.0**	**2.6**	**3.2**	**1.9**

Source of data: PORDATA Note: n.d. = no data available

An analysis across the *Norte* sub-regions demonstrates the higher dispersion of employment in the secondary sector and in its variation in the 2001-2011 period. In 2011, *Tâmega e Sousa* and *Ave* had a percentage of employment in the secondary sector above 50%, contrasting with the figure below 20% of *Douro and Terras de Trás-os-Montes*, diverging substantially from the average (33%). The tertiary sector, as mentioned earlier, is the principal sector in all sub-regions but there is also a substantial dispersion between them. The noteworthy increase registered in the employment in this sector (a mean of 11.8 p.p.) was relatively homogeneous across regions (a standard deviation of 1.1 p.p.). The primary sector has a residual proportion of employment in almost all the sub-regions.

The primary sector was also of little importance in the employment of all the *Centro* sub-regions and the decreases didn't have pronounced oscillations across the sub-regions, being relatively low (a mean of 3.5 p.p.). Conversely, the weight of employment in the secondary sector decreased heavily in all sub-regions (8 p.p. on average). In 2011, only the *Região de Aveiro* and *the Região de Leiria* (about 38%) surpassed the mean of 30% employment in this sector. The tertiary sector was also dominant in terms of employment in all sub-regions, oscillating between 59% (*Região de Aveiro*) and 72% (*Região de Coimbra*) in 2011; from 2001 to 2011 there was a great increase across all sub-regions (a mean of 11.5 p.p.).

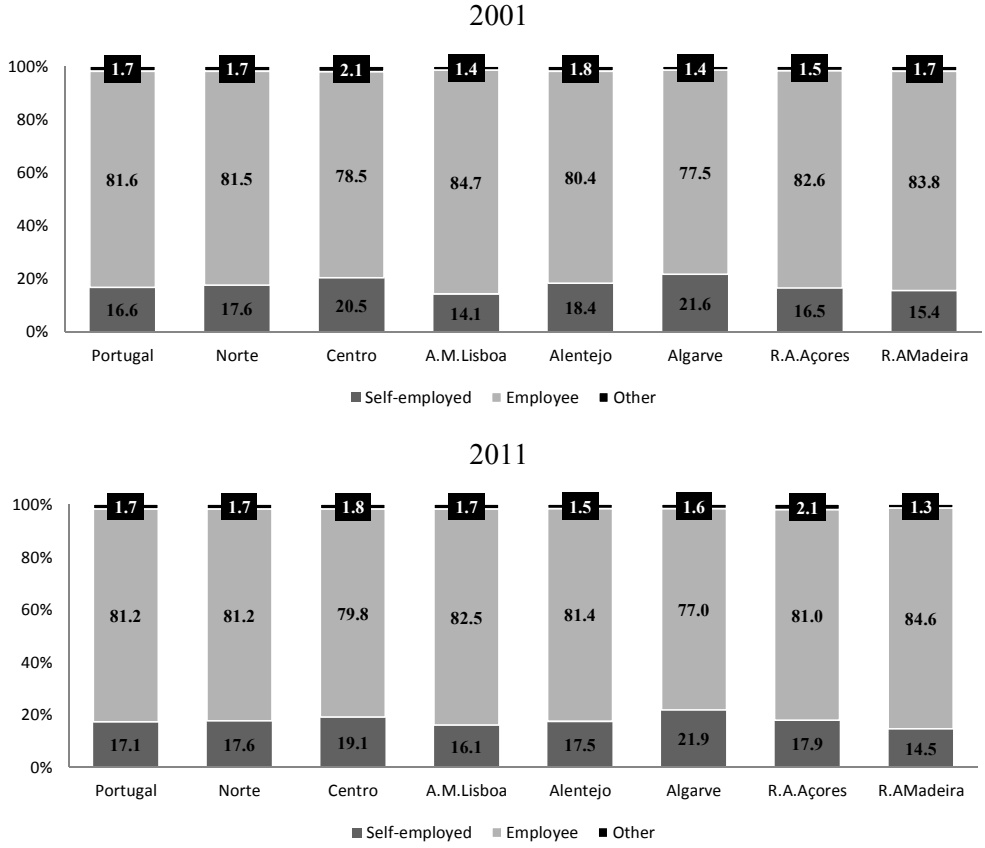
The sub-regions of *Alentejo* stand out by keeping figures of employment in the primary sector with some expression (a mean of 10% in 2011) and by the generalised relatively slight variation from 2001 to 2011. The proportion of employment in the secondary sector is, in general, less preponderant than in the other sub-regions of Portugal, with an average of only 22% in 2011. The great percentage of employment was concentrated in the tertiary sector, and varied between 66% (*Alentejo Litoral*) and 72% (*Alto Alentejo*), in 2011. Additionally, the variations in employment in this sector are, on average, not as pronounced as in other Portuguese sub-regions.

The tendency to a decline in employment in the primary sector and the growing importance of the tertiary sector has been noted in several studies (e.g. Fernández-Macías and Hurley, 2008) as being transversal to the countries and regions of Europe. Despite the losses in the primary sector, however, in some less developed regions of southern Europe it still have a substantial proportion of employment (Garibaldi and Mauro, 2002), as we have identified for some territories of Norte and Alentejo (above 10%).

2.4. Employment by situation in main occupation

An analysis of the proportion of employment by main occupation in Portugal and its respective regions, according to the last two censuses (Figure 5), reveals that the vast majority of workers are employees. In 2011, the Algarve registered the lowest and the Região Autónoma da Madeira the highest figures for the proportion of employees. These regions are the same that displayed the greatest and lowest figures for the percentage of self-employed workers.

Figure 5: Employment by situation in main occupation, Portugal and NUTS II, 2001-2011 (%)



Source of data: PORDATA

At the NUTS III level (Table 5) remains the relative homogeneity across sub-regions as concerns to the repartition of employment by situations as self-employed and employee, especially across the *Centro* and *Alentejo* sub-regions. In the *Norte* there was more dispersion: in 2011, the proportion of self-employed varied between 15% in *Ave* and 27% in *Alto Tâmega*, the sub-regions that also displayed the extreme figures for the situation of employee (69% and 84% in *Alto Tâmega* and *Ave*, respectively). In general, there were slight variations

between 2001 and 2011 for most sub-regions: the proportion of self-employment decreased about 1 p.p., and the percentage of employees grew about 1 p.p. to 2 p.p., on average.

Table 5. Employment by situation in main occupation, NUTS III, 2001 and 2011 (%; p.p.)

NUTS	Self-employed			Employee			Other situations		
	2001	2011	Δ	2001	2011	Δ	2001	2011	Δ
Norte									
Alto Minho	22.2	20.1	-2.1	74.7	77.6	2.9	3.1	2.3	-0.8
Cávado	17.5	17.7	0.2	80.6	80.4	-0.2	1.9	1.9	0.0
Ave	15.0	15.1	0.1	83.8	83.7	-0.1	1.2	1.2	0.0
Á. Metropolitana do Porto	15.1	16.2	1.1	83.5	82.2	-1.3	1.4	1.6	0.2
Alto Tâmega	30.5	27.2	-3.3	64.7	69.1	4.4	4.8	3.7	-1.1
Tâmega e Sousa	15.7	15.5	-0.2	82.9	83.1	0.2	1.4	1.4	0.0
Douro	20.9	19.6	-1.3	76.3	77.7	1.4	2.8	2.7	-0.1
Terras de Trás-os-Montes	27.5	24.3	-3.2	67.3	72.7	5.4	5.2	3.0	-2.2
Mean	**20.6**	**19.5**	**-1.1**	**76.7**	**78.3**	**1.6**	**2.7**	**2.2**	**-0.5**
Standard deviation	**5.9**	**4.3**	**1.7**	**7.4**	**5.2**	**2.4**	**1.6**	**0.9**	**0.8**
Centro									
Oeste	21.5	20.5	-1.0	76.7	77.7	1.0	1.8	1.8	0.0
Região de Aveiro	17.8	17.8	0.0	80.5	80.5	0.0	1.7	1.7	0.0
Região de Coimbra	18.1	17.0	-1.1	79.5	81.0	1.5	2.4	2.0	-0.4
Região de Leiria	19.7	20.0	0.3	78.2	78.4	0.2	2.1	1.6	-0.5
Viseu Dão Lafões	20.3	17.5	-2.8	76.6	80.4	3.8	3.1	2.1	-1.0
Beira Baixa	20.2	17.7	-2.5	77.6	80.8	3.2	2.2	1.5	-0.7
Médio Tejo	17.7	17.3	-0.4	80.3	81.1	0.8	2.0	1.6	-0.4
Beiras e Serra da Estrela	20.2	19.4	-0.8	76.9	78.6	1.7	2.9	2.0	-0.9
Mean	**19.4**	**18.4**	**-1.0**	**78.3**	**79.8**	**1.5**	**2.3**	**1.8**	**-0.5**
Standard deviation	**1.4**	**1.4**	**1.1**	**1.6**	**1.4**	**1.4**	**0.5**	**0.2**	**0.4**
Alentejo									
Alentejo Litoral	19.7	18.0	-1.7	78.3	80.3	2.0	2.0	1.7	-0.3
Baixo Alentejo	19.6	18.5	-1.1	78.3	80.0	1.7	2.1	1.5	-0.6
Lezíria do Tejo	17.2	16.5	-0.7	81.1	82.0	0.9	1.7	1.5	-0.2
Alto Alentejo	16.8	17.0	0.2	80.6	81.3	0.7	2.6	1.7	-0.9
Alentejo Central	16.2	16.3	0.1	81.8	82.1	0.3	2.0	1.6	-0.4
Mean	**17.9**	**17.3**	**-0.6**	**80.0**	**81.1**	**1.1**	**2.1**	**1.6**	**-0.5**
Standard deviation	**1.6**	**1.0**	**0.8**	**1.6**	**1.0**	**0.7**	**0.3**	**0.1**	**0.3**

Source of data: PORDATA Note: n.d. = no data available

To conclude, the substantial proportion of self-employment at the national and subnational level (between 17% and 20%) should be noted. This characteristic supports the view that self-employment is higher in countries where labour market conditions are worse, because entrepreneurship is often a way out of a situation of unemployment. In this sense, in countries such Bulgaria, Cyprus, Greece, Italy and Portugal, which have high unemployment, self-employment is more common than in the EU-27 (European Commission, 2010). Entrepreneurship could thus be seen as important factor for providing employment. Baptista et al. (2008) concluded that there are positive indirect effects of the creation of new businesses on employment growth at the regional level in Portugal.

3. Synchronisation of regional employment

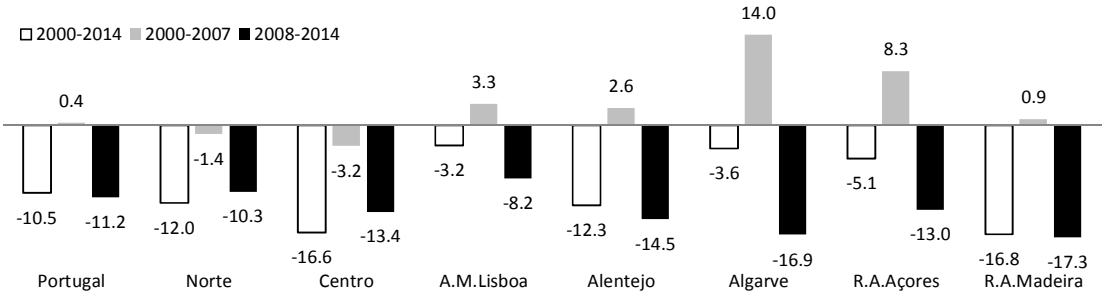
In this section, we focus on the degree of synchronisation across the Portuguese regions, disaggregated to the NUTSIII level over the 2000-2014 period.

3.1. Data

The variable considered in this section is the annual time series of employment, in thousands of individuals, and the main source was the INE database (www.ine.pt). The sample period was constrained by the unavailability of annual data for the regions, at the NUTSIII level, for the new nomenclature (NUTS 2013), for earlier periods. The Figures 6 and 7 give us a picture of the changes for the whole period (2000-2014), the period before (2000-2007) and after the beginning of the recent crisis (2008-2014).

In the whole sample, the *Centro* and the *Região Autónoma da Madeira* saw the highest decreases in employment (17%), followed by *Alentejo* and *Norte* (12%), above the national total (11%). In contrast, the *Área Metropolitana de Lisboa*, the *Algarve* and the *Região Autónoma dos Açores* had the lowest decreases (below 5%). The strong negative impact of the crisis can be seen. In fact, although the variations were positive for most regions (the exceptions are the moderate decrease in *Norte* and *Centro*) in the period 2000-2007, the situation worsened from 2008, with the reduction in employment affecting all regions, ranging between 8% (*Área Metropolitana de Lisboa*) and 17% (*Algarve* and *Região Autónoma da Madeira*).

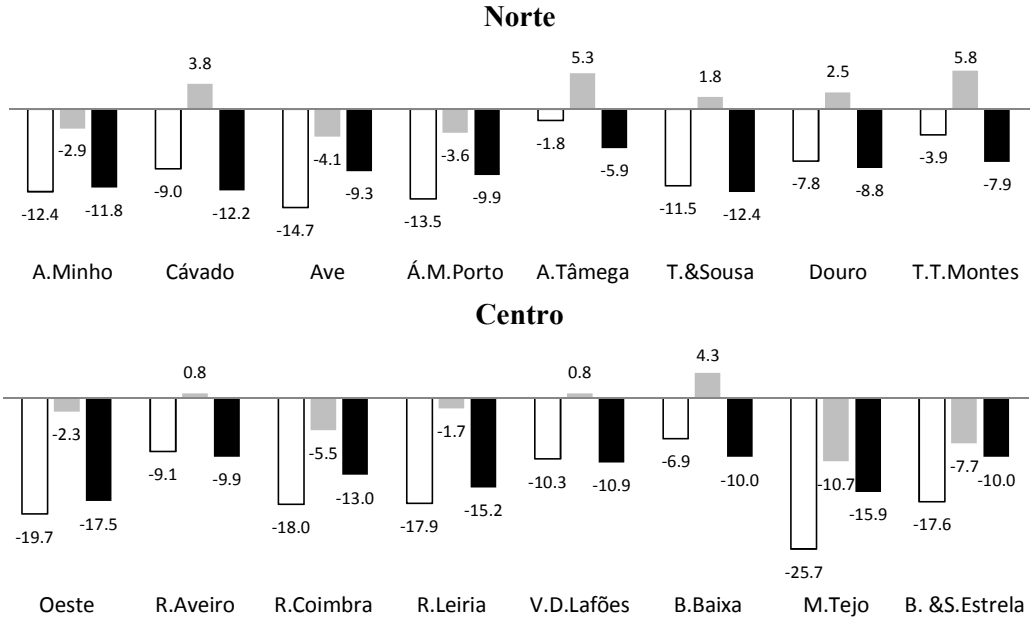
Figure 6: Employment variation, whole period, before and during the crisis, NUTS I and II (%)

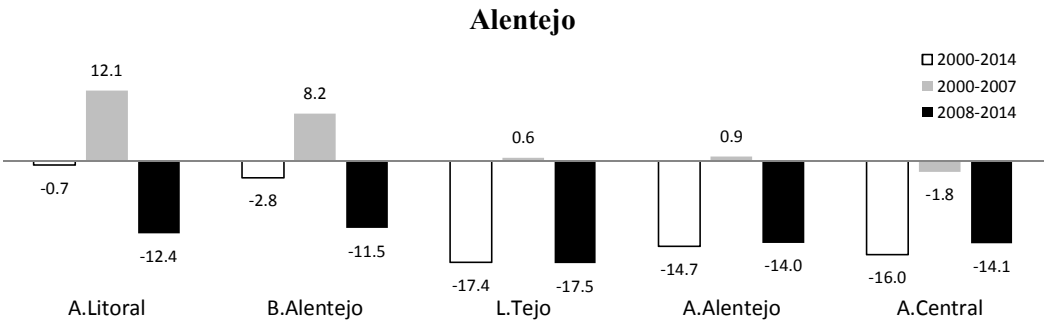


Source: Author's calculations

At the intra-regional level, Figure 7 suggests the same conclusions: a general decrease in employment in the 2000-2014 period, with particular intensity in the crisis period. Marked differences can also be seen across the sub-regions. Over the whole period, *Médio Tejo* stands out as suffering the greatest decrease (27%) and *Alentejo Litoral* as having the smallest negative variation (about 1%); these sub-regions are the same that displayed the greatest reduction (11%) and increase (12%), respectively, in the period before the crisis. Figure 7 also shows that *Oeste* and Alto *Tâmega* were the sub-regions where employment was most and least negatively affected by crisis (18% and 6%, respectively).

Figure 7: Employment variation, whole period, before and during the crisis, NUTS III (%)





Source: author's calculations

3.2. Methods

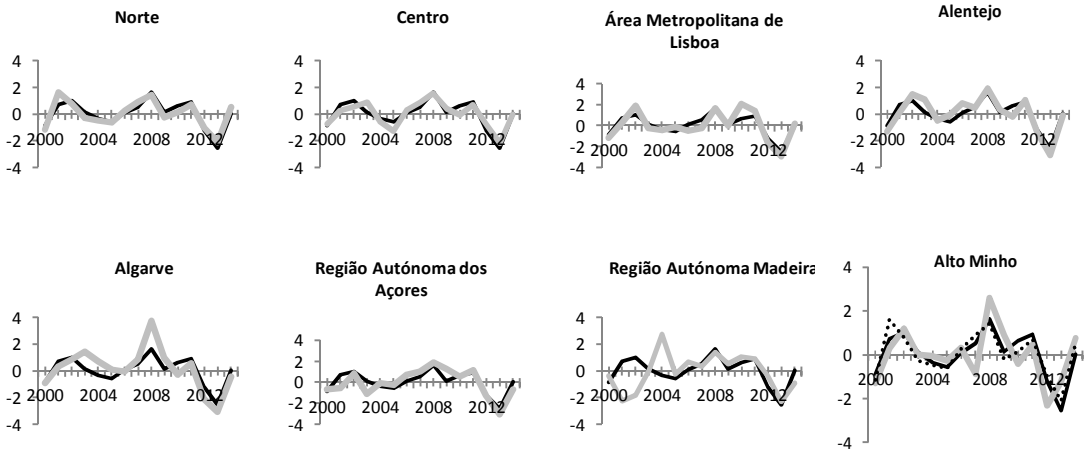
To obtain the cyclical components of the (log) employment series, and in order to make our results robust, we used two of the most widely applied techniques: the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997) and the Baxter-King band-pass (BK) filter (Baxter and King, 1999). The results obtained are qualitatively similar. For this reason, and because the BK filter is preferable from a theoretical point of view (Stock and Watson, 1998), for the sake of brevity, we present only the output obtained by applying the BK filter.[1]

After filtering the series, we calculated the standard deviations so as to measure the evolution of the cyclical volatility of the employment data, as well as the Spearman's rank correlation coefficients between the cycles. First, we obtained the contemporary correlation coefficients between each of the seven NUTSII regions cycles and the national cycle, and then calculated the correlations between each NUTSIII sub-region and the respective NUTS II region, and the national aggregate cycles.

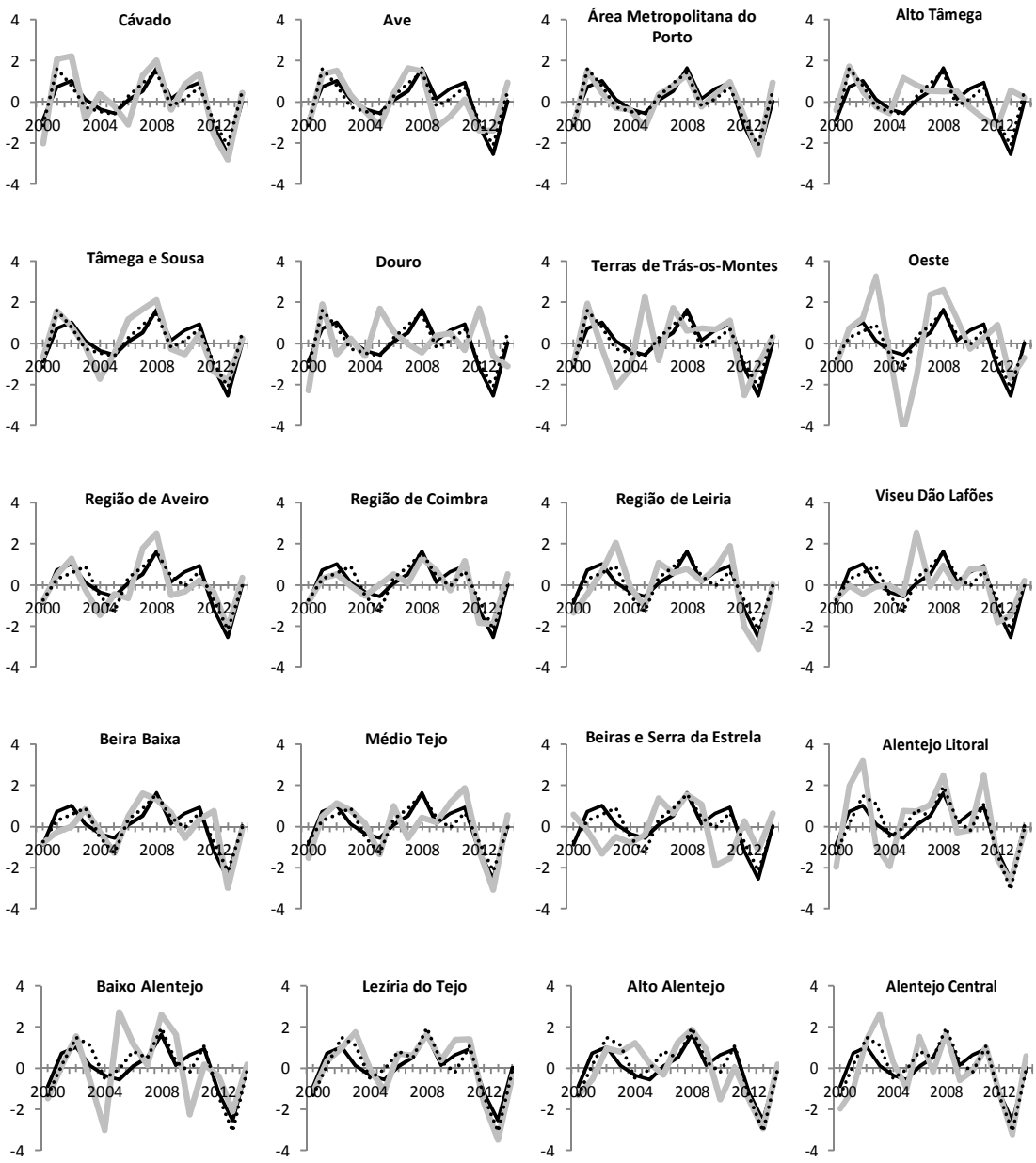
3.3. Results

A visual inspection of the graphs with the cyclical components of employment (Figure 8) and of the Tables 6 and 7, containing the statistics of standard deviation and contemporary correlation coefficients, reveals the diversity of situations in terms of volatility and synchronisation.

Figure 8: Cycles of the employment series, BK Filter, 2000-2014 (%)



[1] In particular, we configured the BK filter to extract fluctuations lasting between 1.5 and 8 years. We set $\lambda = 6.25$ for the HP filter, which is the customary value for annual data (Ravn and Uhlig, 2002). The results obtained from the application of HP filter are available upon request.



Cycle of region or sub-region - Cycle of Portugal - Cycle of respective NUTS II Source: author's calculations

It is noteworthy the significant negative fluctuations of employment occurred for most of the territories in the period after the two economic crisis of the 2000s, the negative deviations around the trend in the years of 2012 and 2013 being of particular prominence.

Table 6. NUTS II: Volatility and cyclical correlations with national cycle, 2000-2014

NUTS II	Standard deviation (%)	Correlations with national cycle
Norte	1.02	0.88***
Centro	0.97	0.81***
A.M.Lisboa	1.36	0.86***
Alentejo	1.27	0.81***
Algarve	1.57	0.69***
R.A.Açores	1.28	0.75***
R.A.Madeira	1.39	0.33

Source: Author's calculations - Note: *** denotes significance at the 1% level

From an analysis of the volatility and the coefficients of correlation (Table 6) we conclude that almost all regions demonstrate a high association (0.7-0.9) with the Portuguese employment cycle. As expected, given their strongest weight in the national aggregate (on average, 34% and 28% respectively), the *Norte* and *Área Metropolitana de Lisboa* are the most synchronised regions. The exception is the *Região Autónoma da Madeira* which is decoupled from the national cycle. The dispersion of regional cycles does not differ substantially, ranging between 1% (*Norte* and *Centro*) and 1.6% (*Algarve*).

Table 7. NUTS III: Volatility and correlation with national and regional cycles, 2000-2014

NUTS III	Standard deviation (%)	Correlations with	
		Portugal	NUTS II
Norte			
Alto Minho	1.18	0.72***	0.66***
Cávado	1.57	0.88***	0.88***
Ave	1.17	0.72***	0.87***
Área Metropolitana do Porto	1.12	0.84***	0.96***
Alto Tâmega	0.78	0.09	0.25
Tâmega e Sousa	1.23	0.78***	0.91***
Douro	1.13	0.12	0.16
Terras de Trás-os-Montes	1.46	0.49*	0.56**
Centro			
Oeste	1.95	0.63**	0.80***
Região de Aveiro	1.19	0.78***	0.71***
Região de Coimbra	0.95	0.74***	0.72***
Região de Leiria	1.42	0.69***	0.80***
Viseu Dão Lafões	1.04	0.59**	0.53**
Beira Baixa	1.14	0.45*	0.79***
Médio Tejo	1.31	0.72***	0.58**
Beiras e Serra da Estrela	1.09	-0.04	0.25
Alentejo			
Alentejo Litoral	1.82	0.85***	0.77***
Baixo Alentejo	1.74	0.41	0.63**
Lezíria do Tejo	1.45	0.83***	0.85***
Alto Alentejo	1.33	0.51**	0.67***
Alentejo Central	1.56	0.61**	0.81***

Source: author's calculations - Note: * ,** and *** denote significance at the 10%, 5% and 1% levels, respectively.

At the intra-regional level (Table 7) there is more heterogeneity. The figures of standard deviation reveals that, on average, the cycles of employment exhibit high dispersion in the sub-regions of *Alentejo*. Comparing the regions we observe that volatility was highest in *Cávado* in the *Norte*; *Oeste* in the *Centro*; *Alentejo Litoral* and *Baixo Alentejo* in *Alentejo*. In these sub-regions, the figures exceeded 1.5% and nearly doubled the range of the sub-regions with the smoothest fluctuations: *Alto Tâmega* (0.8%) and *Região de Coimbra* (1%).

Almost all the sub-regions display a positive and statistically significant coefficient of correlation, *Alto Tâmega*, *Douro*, *Beiras e Serra da Estrela* and *Baixo Alentejo* being the exceptions. The highest degree of synchronisation with the national cycle (between 0.8 and 0.9) was in *Cávado*, *Área Metropolitana do Douro*, *Tâmega e Sousa*, *Região de Aveiro* and *Alentejo Litoral* and *Lezíria do Tejo*. In contrast, *Terras de Trás-os-Montes*, *Beira Baixa* and *Baixo Alentejo* have correlation coefficients below 0.5. In the last case, the coefficient is not statistically significant indicating that the employment cycle of *Baixo Alentejo* is not associated with the national cycle.

With regard to correlations between the cycles of the respective regions, we note that:

(i) Half the *Norte* sub-regions show a very high level of synchronisation (0.9-1.0) with the regional cycle. The correlation is particularly elevated in the case of *Área Metropolitana do Porto.* This is not surprising since employment in this sub-region represents, on

average, 48% of the regional total. Conversely, the *Alto Tâmega* and *Douro* seems to have a decoupled cycle of the region what they belongs;

(ii) The *Centro* sub-regions demonstrate, on average, lower correlations than those of the *Norte* and *Alentejo*; five sub-regions had values between 0.7 and 0.8, the cycle of *Beiras e Serra da Estrela* not being associated with the *Centro* region;

(iii) The *Alentejo* sub-regions present relatively more homogeneity, with correlation coefficients varying between 0.6 and 0.9. As expected, since it has the highest proportion of employment in the *Alentejo* (32% on average), *Lezíria do Tejo* is the most closely synchronised with the *Alentejo* region.

Finally, another central feature of the correlation data is the difference in the degree of synchronisation between the NUTS III cycle and the regional (NUTS II) and national cycles. In fact, in general, the cyclical pattern of the sub-regions is more closely related to the regions that they belong to than that of the Portuguese cycle (there are only five sub-regions where the cyclical correlations decreased). In particular, the positive differences are greater (0.2-0.3) in the cases of *Ave* in the *Norte*, *Oeste* and *Beira Baixa* in the *Centro* and *Baixo Alentejo*, *Alentejo Central* and *Alto Alentejo* in the *Alentejo*. This could indicate the existence of a regional border effect specific to the region in terms of employment. The reduced period of our sample makes the calculation of correlation coefficients for several rolling periods infeasible, however, and does not allow us to extract robust conclusions about the existence of such an effect.

4. Conclusions

In this paper we focused on the differences of employment across Portuguese regions and their respective sub-regions, and evaluated the degree of cyclical synchronisation since the beginning of 2000s, exploring regional information according the new version of NUTS.

The comparison of several indicators between the last two censuses allowed us to conclude that there was a substantial reduction in the employment rate and that Portugal is characterised by substantial regional disparities. The following features were clearly discernible: (i) there is inequality in terms of gender, the employment rate being higher for males than females, although the gap is closing as male employment decreases more quickly; (ii) higher employment prevails in the age groups between 25 and 54, it being the group of young people (15-24 years) who experienced the largest decrease in employment; (iii) the last years were marked by an increase in the tertiary sector share of total employment and a decrease in other sectors; and (iv) the number of employees has increased slightly, in contrast to a slight decrease in the number of self-employed.

On the other hand, the analysis of volatility and correlation coefficients has highlighted four main results. First, at regional level, the dispersion of employment cycles does not differ substantially and there has been, in general, a strong association with the aggregated Portuguese employment cycle, the coast regions of Norte and the Área Metropolitana de Lisboa being the most synchronised; conversely, the cycle of the inland Madeira region is not associated with the national cycle. Second, there is more heterogeneity across the sub-regions. There is great diversity in correlation with the national cycle, with some sub-regions demonstrating a strong association, others presenting moderate or non-significant correlation coefficients. Third, the sub-regions are more closely related with regional cycles of employment than with the national cycle of employment. The situations vary considerably, with the Alentejo sub-regions presenting relatively more homogeneity than the sub-regions of the Norte and the Centro.

The findings of the research reported in this paper have important policy implications. It's extremely important that policy makers understand the unequal distribution of employment in the Portuguese territory. This will help to design the best development policies and construct appropriate responses to counteract the regional differences. In this context, measures focusing on job creation should be particularly directed to regions with historically low employment rates (e.g. inland areas and low density territories) and for the segments and social groups who find it more difficult to access labour markets (e.g. women and youth). The Europe 2020 Strategy (smart, green and inclusive growth), which aims to boost employment and economic growth in Europe, constitutes an opportunity to narrow the employment disparities in Portuguese regions.

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