Chapter 10
The Role of Education in Regional Labour Markets: Evidence from Two Fragile Economies

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JEL Classification I26 • J64 • R12

10.1 Introduction

Disparities across economies are sizeable and persistent within the European Union. This is so, regardless of the measure that is used to proxy for the level of social and economic development (e.g., EC 2010). In the case of the labour market, it is well known that the incidence of unemployment varies enormously between member states as a result of differences in the functioning of that market but also in the fundamentals of the economy in each country. Less flexible institutions and higher regulation have been claimed to produce more unemployment in the southern EU countries, particularly during downturns (OECD 2012). In this context, Greece and Spain are two paradigmatic cases in the EU with regard to their high levels of unemployment. In 2012, one out of four individuals in the labour force were unemployed in these two countries. This is in sharp contrast with figures on unemployment in countries such as Austria, the Netherlands and Germany (around 5%). Actually, the Greek and Spanish unemployment rates are far above those in other southern economies such as Italy and Portugal, and in Ireland, which was also strongly affected by the economic crisis.

If differences across economies in labour market institutions and regulation were the sole reason behind the disparities in the incidence of unemployment, we should

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M. Fonseca, U. Fratesi (eds.), *Regional Upgrading in Southern Europe*, Advances in Spatial Science, DOI 10.1007/978-3-319-49818-8_10

not observe significant differences within countries; that is to say between regions in a country with similar institutional frameworks. However, this is not the case. As is shown in this chapter, the order of magnitude of regional disparities in unemployment rates in Greece and Spain is similar, or even larger, than the one between EU countries. As an example, in the spring of 2012 unemployment in Dytiki Makedonia was 30%, twice the figure of 14.7% in the Greek region with the lowest unemployment rate, Ionia Nisia. Similar regional differences exist in Spain, with the unemployment rate in Andalusia (34.6%) being more than double that of the Basque Country (14.9%).

Alongside the differences in unemployment, economies in the EU also differ in terms of the level of wages earned by workers. Wages in some countries are higher to compensate for differences in the cost of living, but also because of differences in the level of firms' productivity, and in institutions of the labour market, e.g., the system of collective bargaining (Peeters and den Reijer 2011). Whatever the case, the average hourly earnings in Greece and Spain are below the EU27 and the Euro area—both in nominal and in real terms. Actually, leaving aside the central and eastern member states, these two countries, jointly with Portugal, are at the bottom of the list of EU member states with regard to the wage level. Of course, significant regional disparities in wages exist also within countries in the EU (Duranton and Monastiriotis 2002; García and Molina 2002; Pereira and Galego 2011). As we show later in this chapter, in Greece and Spain such disparities are also very sizeable and, importantly, they have been quite persistent during the crisis, despite the overall trend of declining average wages following the crisis in the two countries.

Developments in unemployment and wages are important both at the aggregate and at the individual level—reflecting conditions of labour market dynamism and labour market success, respectively. The link between wages and unemployment (especially in relation to the interplay between the individual and aggregate levels) has been widely discussed in the literature, often with conflicting predictions about the nature as well as the direction of the relationship (e.g., from the theory of compensating differentials proposing that high wages are induced by *high* unemployment as a compensation for it; to the theoretical explanations of the wage curve, which suggest that high wages are induced by *low* unemployment, either via efficiency wage considerations or via union bargaining power) (Nijkamp and Poot 2005). Our interest in this chapter, as we explain below, is not directly in the relationship between these two variables, but rather in how these two variables respond, both at the aggregate and the individual level, to the human capital endowments of regions and individuals and especially how this response varies across space (for different regions) in any particular point in time and over the business cycle. By looking at both wages and unemployment we can obtain a more spherical picture about the role of education for the regional labour markets on the aggregate and for allocating individual workers into jobs: both in the sense of affecting one's chances of getting a job (unemployment) and in the sense of affecting the quality of the job obtained (as proxied by the wage). Our focus is on

the cases of Greece and Spain, two countries with known problems of regional disparity and a substantially accentuated impact from the recent crisis.

In this context, the first objective of this chapter is to describe regional disparities in the labour market performance of the two countries during the period covering the economic boom from the early years of the last decade to the great recession that was sparked by the Eurozone crisis at the start of this decade. This is of interest since it is well known that the crisis hit these two economies with particular virulence due to their macroeconomic imbalances and the weaknesses of their economic structures. This resulted in adjustments in employment and wages in industries, and in connection with this also in regions, that were among the most dynamic during the booming period.

Arguably, an important factor in processes of adjustment, and in the determination of equilibrium outcomes with regard to wages and unemployment more generally, has to do with the human capital endowment available to each (regional or national) economy and thus with the level of education of individuals residing in each economy. Thus, as a second objective, in this chapter we provide evidence of the effect of the individuals' level of education on unemployment and wages in each region. Under the assumption that the higher the level of educational attainment of an individual, the lower her chances are to be unemployed and the higher the wage she earns, our hypothesis is that, ceteris paribus, regions with high endowments of education had less unemployment and a higher wage level—and increasingly so, in relative terms, during the crisis. This implies that the regional distribution of individuals' education would be a key driver of disparities in labour market outcomes and in regional responses to the crisis.

That said, the contribution of education to favourable economic outcomes, both at the individual and at the aggregate/regional level, should not be taken as fixed across space. In contrast, it is reasonable to expect that this contribution will vary—sometimes widely—across labour markets of different fundamentals, different structural characteristics and different capacities. Following this line of thought, our contribution in this chapter aims, in addition to the above, to provide evidence on the variability of the impact that education has on unemployment and wages, depending on the region. Our hypothesis is that education acts as a mechanism for sorting individuals participating in the labour market into employment or unemployment, and that for the salaried workers it positively affects wages through improvements in worker's productivity. In other words, education plays a role for allocating workers to jobs—both in a dichotomous sense (employment vs. unemployment) and in terms of job quality (as proxied by the level of wages). However, the strength of these two effects is shaped by region-level characteristics, causing the sorting mechanism and the wage return to be more intense in some regions than in others. Although we do not investigate empirically which region-level characteristics may be responsible for the variations that we document across regions, it is intuitive to expect that these will relate to both geographical and labour market parameters—for example, accessibility and inter-regional labour mobility, or—and perhaps most notably—sectoral structure/specialisations and labour market thickness/density.

The empirical evidence on regional unemployment rates and wage levels in Greece and Spain, from 2002 to 2012, is based on micro-level data from the Labour Force Survey and the Structure of Earnings Survey. These data also allow us to compute a measure of educational attainment for individuals in each region, which is used to estimate the corresponding effect of education on the probability of being unemployed and on the wage return to schooling. These estimates are then used to assess regional disparities, not simply in the levels of education but also in the *effect* of education with respect to both unemployment and wages.

Our analysis reveals some common and interesting patterns in the two countries. In both countries, sizeable disparities exist not only in wages and unemployment but also in average human capital endowments (years of schooling). But while average years of schooling, both for the employed and for the labour force as a whole, increased notably during the crisis—consistent with expectations about intensified sorting and bumping-down when demand collapses—regional disparities in these remained rather stable, showing persistence across the business cycle. In turn, unemployment differentials seem to have followed a pro-cyclical trend in both countries, rising in the pre-crisis period but declining during the crisis. Pro-cyclicality also characterizes the evolution of regional wage disparities in Spain—but not in Greece. The role of education as a sorting mechanism during the crisis is further manifested by our analysis of the impact of education on the probability of unemployment and on individuals' wages. We find that the marginal effect of education on an individual's probability of being employed has increased dramatically during the crisis—albeit with significant differences across regions. In contrast, returns to education (and thus the contribution of education to obtaining a better job) have increased much more modestly and—importantly—for a large number of Greek regions, especially in the northern parts of the country, they have actually declined with the crisis. The rest of the chapter is organized as follows. The source of the datasets and the details on the selected samples and the periods under analysis are provided in the next section. Section 6.3 describes the distribution of wages and unemployment rates in the two countries under analysis and examines the extent of regional disparities in these aggregates. It also pays attention to the evolution over the period under analysis. A similar description regarding the individuals' endowment of education is provided in Sect. 6.4. Sections 6.5 and 6.6 look in turn into the effect that education has on unemployment rates and wages (respectively), based on estimates from an econometric analysis of unemployment probabilities and returns to schooling. In these two sections we first introduce the empirical model used to obtain the estimate of the effect of education and then summarize the main results, stressing both the regional variability and the changes over the time period. Finally, the discussion and interpretation of the results and some concluding comments are provided in Sect. 6.7.

10.2 Datasets

Micro-level data is required to study the effect of individuals' education on their labour market performance (with regard to the likelihood of being employed or unemployed, and with respect to their wage level). Since we are interested in the effect of education in each of the Greek and Spanish regions, the source of the micro-data must ensure representativeness at the territorial level; that is to say, the sample for each region needs to represent the corresponding population. In the case of the effect of educational attainment on the probability of being unemployed, such information is available from the Labour Force Survey (LFS). The LFS also includes information on wage earnings in the Greek sample, while in the case of Spain such information is obtained from the Structure of Earnings Survey (SES), as the Spanish LFS does not contain information on individuals' wages. The Greek LFS is conducted under the auspices of the Hellenic Statistical Authority (ELSTAT) on a quarterly basis. The Spanish LFS is produced by the Spanish National Institute for Statistics (INE) also on a quarterly basis, while the SES is conducted every 4 years and, for the analysis conducted here, covers the years 2002, 2006 and 2010.[1] To maximize the comparability of the effects of education on unemployment and wages in Spain, we selected the same years for the LFS data. Thus, our analysis of unemployment is based on LFS data for 2002, 2006, 2010 and 2012 in both countries; our analysis of wages for Greece is based on the same data-source and for the same years; while our analysis of wages for Spain is based on the SES data and covers only the years 2002, 2006 and 2010. Concerning the LFS data, as in similar studies in the literature, we selected the information corresponding to the second quarter of each year (March–May). We assume that the second quarter is the least affected by seasonal fluctuations, that particularly affects regions specialized in tourism and related services and in activities of the primary sector. In any case, it should be noted that the evidence reported in the following sections on the effect of education on unemployment is robust to the selection of any of the other quarters.

The LFS provides information on the working status of individuals participating in the labour market, i.e., whether they are employed or unemployed. It also contains information regarding the highest educational level attained by the individual, the age at which the individual completed their continuous full-time education, and other personal and household characteristics that are considered to exert an effect on working status (e.g., gender, nationality, age, and number of household members). The spring quarter of the Greek LFS surveys includes around 31,000 households (approximately 76,000 individuals). After restricting our sample to individuals aged between 16 and 65, and some further data cleaning, we are left

[1] SES data are also available for Greece although access to this data is restricted and at the time of writing this chapter such data were not available to us. In any case, as we show later, the impact of the crisis in Greece, in contrast to what happened in Spain, unfolded largely after 2010 and thus the use of LFS data, which covers the years up to 2012 is imperative.

with around 50,000 individuals for each of our study years, of which around 18,000 are salaried employees (wage earners).[2] In Spain, the LFS sample includes approximately 60,000 households, equivalent to around 180,000 people interviewed in each quarter. In our analysis, the selected sample includes individuals aged between 16 and 65 that after some data cleaning, results in a sample of around 110,000 individuals in each of the study years. As indicated above, the design of the LFS ensures that the samples are representative of the national as well as the regional populations for each of the 13 Greek and 17 Spanish NUTS2 regions, allowing us to obtain reliable estimates of the effect of education on the probability of being unemployed at the regional level in the two countries.

In turn, the SES is also produced by the INE according to the standards defined by EUROSTAT in a statistical operation that covers the entire European Union. This survey provides information on wages and the effective working time for all individuals in the sample. It also includes information about an extensive set of worker characteristics (including the highest educational level attained) and of firm characteristics. We purged the original sample provided by the INE to remove outliers and to ensure comparability of the information in the three periods analysed. In that regard, it should be noted that the sample for 2002 did not include workers in firms with less than 10 employees, so in this study we decided to standardize the information regarding the 3 years analysed, removing observations for workers in establishments with less than 10 employees in the samples for 2006 and 2010. Something similar was done with respect to sectors of activity covered by the SES in each of the 3 years. Employees of the public sector were not included in the analysis, since this sector was incorporated in the survey for 2010.[3] From the sample provided by the INE for each of the 3 years, we selected the observations for the full-time employees aged 65 years or less, from all Spanish regions with the exception of Ceuta and Melilla, which are two small Spanish cities in the North of Africa and thus with peculiar characteristics. The final sample used in our analysis of the effect of education on wages for the Spanish regions is of 120,593 individuals in 2002, 155,754 in 2006 and 127,202 in 2010. As indicated above for the case of the LFS, the design of the SES also ensures the representativeness of the sample for each of the Spanish NUTS2 regions, allowing us to obtain a reliable estimate of the returns to education in each region.

Using the information in the SES for each individual, we calculated the gross hourly wage as the gross wage (before taxes and including the worker's

[2]Our working-age sample is 50,529, 48,605, 49,076 and 38,151 for the years 2002, 2006, 2010 and 2012 respectively. Wage-earners for the same years are 17,188, 17,978, 17,861 and 11,363. Note that in 2012 total sample size drops to 25,000 households (61,000 individuals).

[3]For Greece, the LFS data cover all employees in all sectors. This adds crucial detail in the information processed in this chapter, as small-firm employment in Greece accounts for a large part of total salaried employment. To keep consistency with the wage data for Spain, we exclude public-sector workers from the Greek sample. The implication, however, is that the wage data for Greece are not directly comparable with those of Spain. We account for this in our subsequent discussion of the two country cases in Sects. 6.3 and 6.6.

contribution to the social insurance system) paid by the firm in the month of October of the corresponding year divided by the number of hours actually worked by the employee during that month (the result of multiplying the weekly hours provided in the survey by the average number of weeks in a month, 4.429). The wage includes the base salary and extra payments related to the job and the workplace conditions, such as bonuses for seniority, knowledge, specific training, work during the night and holidays, dangerous tasks, toxicity, and productivity. However, it does not include payments for overtime work, since the SES does not provide all the information required for its proper inclusion in the calculation of the payment per hour actually worked. A similar approach has been taken for the calculation of hourly gross wages in Greece. In the Greek LFS wage data refer to weekly gross earnings (including bonuses but excluding overtime pay) and are reported in bands of 250 €. We divided the mean value of the wage income bands per observation by the reported usual weekly hours to create a pseudo-continuous wage variable.[4] This is an approach typically used in the case of wage data from the Greek LFS and, as has been shown elsewhere (Christopoulou and Monastiriotis 2014, 2016), it provides consistent results in a wage-equations context. As mentioned already, given these differences in the measurement and coverage of the wage data in the two datasets, the average regional wage levels that we derive are not directly comparable between the two countries (the use of small firms in the Greek data will tend to produce lower average wages than in Spain) and the same can be argued for the estimated returns to schooling in the two countries, to the extent that the latter vary by firm size. This, however, does not affect the main aim of our analysis, that is, assessing the extent of regional disparities, and their evolution over time, *within* each country with regard to average wages and the returns to schooling.

10.3 Wage and Unemployment Regional Disparities

As a first step in our analysis, this section examines the wage level and the unemployment rate in each region of the two countries for the years under analysis. Beyond the particular figure for each region and year, the main aim is to provide evidence on the magnitude of the regional labour market disparities in Greece and Spain, and how they evolved during the recent expansive and recessive periods. Table 10.1 summarizes the information for the Greek regions; that information for Spain is in Table 10.2.

Figures for Greece in Table 10.1 indicate that the average nominal wage of private sector workers in the entire country rose during the expansion and the early

[4]For the top, open-ended band, we set the upper limit to 2.250 € (calculated as the lower limit of the open interval plus two times the width of the closed intervals). We also experimented with other 'mean' values for this band, but this did not influence the substance of the results we obtain.

Table 10.1 Wage per hour (€) and unemployment rate (%) in the Greek regions

	2002		2006		2010		2012	
	Wage	Urate	Wage	Urate	Wage	Urate	Wage	Urate
Anatoliki Mak.	3.73	10.89	4.71	12.21	5.20	14.77	4.79	24.76
Kentriki Mak.	3.87	11.50	4.86	10.01	5.44	13.16	5.11	25.67
Dytiki Mak.	4.15	15.11	4.79	15.46	5.55	15.18	5.26	30.76
Ipeiros	3.66	12.58	4.67	9.57	5.48	12.84	4.82	22.97
Thessalia	3.67	11.77	4.64	8.67	5.37	11.88	5.04	22.86
Ionia Nisia	3.42	7.49	4.77	14.29	5.11	12.87	5.03	14.92
Dytiki Ellada	3.92	11.60	4.91	9.70	5.29	11.52	4.91	24.83
Sterea Ellada	4.15	10.56	5.00	9.32	5.74	12.04	5.19	28.76
Attiki	4.28	9.80	5.18	8.32	6.03	11.86	5.83	24.38
Peloponnisos	3.95	9.35	4.64	8.56	5.38	10.57	4.71	20.48
Voreio Aigaio	4.11	10.36	4.70	10.01	5.23	8.58	4.83	22.45
Notio Aigaio	3.63	16.34	5.02	8.20	5.80	12.75	4.45	17.32
Kriti	3.74	7.53	4.69	6.48	5.58	11.35	5.04	23.56
Greece	4.05	10.64	4.98	9.24	5.72	12.23	5.40	24.20

Table 10.2 Wage per hour (€) and unemployment rate (%) in the Spanish regions

	2002		2006		2010		2012
	Wage	Urates	Wage	Urates	Wage	Urates	Urates
Andalusia	7.50	18.93	8.10	12.73	11.06	27.93	34.00
Aragon	7.99	5.87	9.21	5.78	11.30	14.29	18.78
Asturias	7.34	10.39	8.40	8.12	10.93	16.44	21.14
Balearic Isl.	6.50	6.92	8.31	6.69	10.80	19.98	21.29
Canary Isl.	6.14	11.28	7.05	11.49	9.45	29.70	33.42
Cantabria	6.49	9.80	8.04	6.74	10.84	13.93	17.56
Castile Leon	6.43	10.75	8.46	8.41	10.61	16.43	19.89
Castile La Mancha	7.02	9.38	7.87	8.99	10.42	21.48	28.82
Catalonia	8.56	9.60	10.11	6.51	11.95	17.85	22.12
Valencia	6.68	11.16	8.23	7.86	10.65	23.89	27.24
Extremadura	6.49	18.72	6.63	13.74	9.44	22.52	33.45
Galicia	6.42	12.09	7.80	8.68	9.72	15.71	21.22
Madrid	8.96	6.96	10.53	7.03	11.89	16.53	19.04
Murcia	6.45	11.32	7.65	7.94	10.74	21.35	26.26
Navarre	8.78	5.14	10.25	5.60	11.64	10.99	16.60
Basque C.	9.61	9.39	11.09	7.15	13.61	10.47	14.65
La Rioja	6.75	7.60	8.01	6.14	9.28	12.28	22.80
Spain	7.90	11.25	9.25	8.58	11.32	20.21	24.78

Note: The data on wages for the Spanish regions are not available for 2012.

stages of the crisis, from 2002 to 2010. In turn, the impact of the crisis in the Greek economy caused a decrease in the average wage in 2012. A similar pattern in the evolution of the wage level is observed in all the Greek regions. It is interesting to

note that despite the dramatic effects of the crisis, the wage at the end of the period under analysis was above the level in 2006 in the country as a whole and in most of its regions. The exceptions include Notio Aigaio where the wage in 2012 was 11% lower than the level in 2006, and Dytiki Ellada with the same level in both years.

In fact, regional disparities in wages were clearly affected by the situation of the Greek economy over the period under analysis. For instance, the average wage in Attiki in 2002 was 25% higher than that in Ionia Nisia, which was at the bottom in the regional ranking of that year. Attiki ranked first in the other 3 years under analysis. However, neither the gap nor the region with the lowest wage level remained stable. The wage gaps between Attiki and Thessalia in 2006, and Attiki and Ionia Nisia in 2010, were 12 and 18%, respectively. In contrast, the wage in Attiki was as much as 31% higher than the level in Notio Aigaio in 2012. Figures on wages in Table 10.1 also reveal that the period of expansion and the impact of the great depression modified the relative situation of a large number of regions. The most striking evidence of churning in the regional distribution is that of Notio Aigaio, a region which relies greatly on tourism and which is thus highly dependent on fluctuations in the economic cycle. This region was the second at the bottom of the list in 2002, with a wage level that was 18% lower than the one in Attiki. During the boom, it experienced a notable improvement in the wage level that led it to be ranked second in 2006 and 2010, with wage levels only 3 and 4% lower than in Attiki. However, the crisis had a stronger impact on Notio Aigaio, causing a sharp decrease in its wages which led the region to the lowest position in the ranking, and a gap with respect to Attiki that was as wide as the above-mentioned, 31%.

The coefficient of variation, as a simple but useful measure of regional dispersion in wage levels, decreased quite substantially from 6.6% in 2002 to 3.6% in 2006, and increased from that year on, to 4.8% in 2010 and 6.6% in 2012. So, it seems that a certain process of convergence in regional wages came to an end as a result of the crisis.

The information in Table 10.1 also provides evidence on unemployment rates. In the country as a whole they were around 10% in the expansive period, rising to a bit more than 12% in 2010. But it was in 2012 when the destruction of jobs caused by the crisis led the Greek unemployment rate to as much as 24%. With almost no exceptions, the same pattern in the evolution of unemployment is observed in the Greek regions, though the changes were more dramatic in some regions that, as will be discussed later, caused variations over time in the amount of regional disparities. In the first part of the period (2002–2006), unemployment rates declined in most regions, although by no means in all—thus resulting in an overall widening of the regional distribution of unemployment, as the most dynamic regions appear to have benefited more from the expansion of the economy nationally. The increase in unemployment in 2010 and, particularly, in 2012 did not prevent the persistence of a substantial gap between regions with the highest and lowest rates (15.2% in Dytiki Makedonia vis-à-vis 8.6% in Voreio Aigaio in 2010, and 30.8% in the former region versus 17.3% in Notio Aigaio in 2012). Nevertheless, with a few exceptions (mainly, Notio Aigaio and Peloponnisos, the largest increases in unemployment between 2006 and 2012 occurred in the regions that had originally below-national

unemployment rates (Kriti, Sterea Ellada, Attiki, Thessalia). As a result, the increase in the country-average unemployment rate was combined with a decrease also in disparities, as measured by the coefficient of variation, during the years of the crisis. The coefficient of variation went down from 0.24 and 0.27 in 2002 and 2006, to 0.14 and 0.17 in 2010 and 2012.

The average wage and the unemployment rates in Spain and in each of its regions are shown in Table 10.2. Figures for the country as a whole reveal that the average nominal wage increased over the period for which data for Spain is available. Interestingly, the average nominal hourly wage in 2010, when the crisis already had exerted its initial effects in the Spanish economy, was 22% higher than the level in 2006, far above the 8% inflation rate in that period.

On the other hand, Table 10.2 provides clear evidence on the extent of regional wage disparities in Spain. At the beginning of the last decade, the average wage levels in Catalonia, Madrid, Navarre and the Basque Country were about 50% higher than that observed for regions with the lowest levels, the Canary Islands, Castile Leon, Extremadura, Galicia and Murcia. With few exceptions, the ranking of regions was maintained throughout the decade, although the dispersion decreased over the period, particularly since the beginning of the crisis. In 2002, the coefficient of variation provides a value of 0.14, only slightly above the one in 2006 which amounts to 0.13. This is in contrast with the value for 2010, which decreases to 0.10. In line with this, the wage gap between regions with extreme levels exceeded 60% in 2006, falling to just under 50% in 2010. The figures for the last year suggest that the reason behind the decline in the degree of regional inequality is on the moderate increase in the regions that have traditionally presented higher average wages. Thus, the deviation from the Spanish average in Catalonia, Madrid and Navarre was less in 2010 than in previous periods. The exception is the Basque Country, which was able to maintain the distance with respect to the wage level in the rest of the country.

With regard to the figures for the unemployment rate in Spain, Table 10.2 shows a marked cyclical evolution, with continuous decrease over the expansion and rapid rebound following the recession at the end of the decade. As a result, one out of four individuals participating in the labour market were unemployed in the spring of 2012. When compared with the unemployment figures in Greece, it is evident that the crisis hit Spain much earlier than Greece (with unemployment rising to 12.2% in Greece versus 20.2% in Spain in 2010), although both countries converged to similar unemployment rates by 2012.

As in previous decades, Andalusia and Extremadura were the Spanish regions showing the highest unemployment rates in 2002, with a value slightly below 20%, substantially higher than in the country as a whole (11.2%). This is in sharp contrast with rates between 5% and 7% observed in Aragon, Balearic Islands, Madrid and Navarre. Unemployment went down in the whole of Spain in 2006, largely as a result of the decrease in regions with persistently high rates. In fact, the decline in regions that had lower rates in 2002 is negligible, suggesting the existence of a natural rate of unemployment in these regions, of around 6%. As a result, regional differences in unemployment rates decreased in 2006 compared to those observed

in 2002 (the coefficient of variation went down from 0.34 to 0.28), although there were no significant changes in the ranking (Andalusia, Extremadura and the Canary Islands stayed among the regions with higher rates, whereas Aragon, Balearic Islands and Navarre are among those showing lower rates). As mentioned above, the unemployment rate in the country as a whole rose almost 12 points to over 20% in 2010. Regions with historically high rates, such as Andalusia, Extremadura and the Canary Islands contributed significantly to that increase, with unemployment rates doubling (and in some cases almost tripling) compared to their 2006 values. Other regions, whose labour market benefited largely from the expansive period, also made a significant contribution. For instance, unemployment rates in the Balearic Islands, Castile La Mancha, Valencia and Murcia rose from about 8% to 20% or more. By contrast, the unemployment rate in other regions stood at values clearly below average, with Navarre and the Basque Country having rates slightly above 10%, almost half the national average. In any case, and despite regional asymmetries in the response to the crisis, the overall extent of disparities remained similar in 2010 to that observed in 2006 (the coefficient of variation remained at 28% in 2010). The deepening of the recession in 2012 caused further increases in the unemployment rate in all regions that, ultimately, provoked a reduction in the coefficient of variation, to a value of 0.25.

All in all, the simple descriptive analysis confirms the evidence reported in studies for previous periods on the existence of outstanding regional disparities in wages and unemployment rates in Greece and Spain. With the crisis, regional disparities in both unemployment and wages seem to have declined mildly in Spain; but in Greece disparities appear to have followed an upward trend as the crisis intensified (in 2012). In the next section we look at whether a similar picture, with regard to regional disparities and their evolution over time, characterizes the distribution of education endowments in the two countries.

10.4 Regional Endowments of Education

To measure the regional levels in the endowment of education, and the extent of cross-regional disparities in it, we have relied as before on the micro-data derived from the LFS and SES databases. For all regions in the two countries we have computed the average years of schooling (a well-known synthetic measure of educational attainment), for the 4 years under analysis. Results for the active population and for the wage earners are summarized in Tables 10.3 and 10.4 for, respectively, Greece and Spain.

The level of educational attainment increased over the period under analysis in the two countries, both for the active population and the wage earners. Years of schooling of the active Greek population increased by 1.2 years between 2002 and 2012, which corresponds to an increase of more than 10% in a decade. A similar improvement in the endowment of education in this country is observed for the group of wage earners. The rise in the measure of education was somewhat lower in

Table 10.3 Average years of schooling of active, and wage earners populations in the Greek regions

	Actives				Wage earners			
	2002	2006	2010	2012	2002	2006	2010	2012
Anatoliki Mak.	10.22	11.10	11.47	11.51	10.36	11.01	11.68	12.26
Kentriki Mak.	11.94	12.42	12.78	13.04	12.05	12.41	12.65	13.15
Dytiki Mak.	11.16	11.81	11.97	12.39	11.23	11.52	12.07	12.61
Ipeiros	11.23	11.72	11.92	12.20	11.36	11.29	11.77	11.62
Thessalia	11.10	11.89	12.33	12.55	11.34	11.61	12.30	12.42
Ionia Nisia	10.67	11.09	11.53	11.68	10.63	11.38	11.40	11.70
Dytiki Ellada	10.68	11.62	11.91	12.12	10.82	11.51	11.90	12.20
Sterea Ellada	10.61	11.53	11.73	12.20	10.56	11.29	11.29	11.98
Attiki	12.93	13.49	13.75	14.09	12.61	13.06	13.30	13.87
Peloponnisos	10.98	11.44	11.75	12.07	11.57	11.67	11.84	12.01
Voreio Aigaio	11.26	12.11	12.35	12.33	11.46	11.80	12.12	11.76
Notio Aigaio	10.90	11.72	11.53	12.31	10.57	11.40	11.38	12.68
Kriti	11.14	11.92	11.83	12.16	11.43	11.90	11.59	12.36
Greece	11.80	12.45	12.72	13.03	11.95	12.37	12.63	13.16

Table 10.4 Average years of schooling of active, and wage earners populations in the Spanish regions

	Actives				Wage earners		
	2002	2006	2010	2012	2002	2006	2010
Andalusia	10.13	10.82	10.92	11.00	10.43	10.20	11.35
Aragon	11.07	11.72	11.70	11.75	10.46	10.65	11.40
Asturias	11.09	11.57	11.99	12.15	10.46	10.87	11.34
Balearic Isl.	10.50	10.95	11.05	11.29	9.39	9.34	10.45
Canary Isl.	10.40	10.83	10.77	10.93	9.65	9.28	10.70
Cantabria	10.96	11.72	12.09	12.15	9.88	10.41	11.24
Castile Leon	10.80	11.32	11.62	11.78	9.85	10.56	11.01
Castile La Mancha	10.16	10.61	10.88	11.03	10.19	10.05	10.52
Catalonia	11.17	11.52	11.43	11.69	10.69	11.17	11.58
Valencia	10.69	11.30	11.29	11.47	10.00	10.15	11.03
Extremadura	10.14	10.83	11.01	10.97	10.36	9.81	11.10
Galicia	10.43	11.38	11.65	11.67	10.15	10.24	11.09
Madrid	11.92	12.10	12.26	12.36	11.68	11.58	12.09
Murcia	10.60	10.75	10.65	10.88	10.23	9.95	10.95
Navarre	11.45	12.01	12.34	12.03	10.95	10.78	11.29
Basque C.	11.72	12.50	12.73	12.76	11.46	11.69	11.99
La Rioja	10.80	11.40	11.86	11.95	9.35	9.09	9.92
Spain	10.88	11.39	11.47	11.60	10.67	10.77	11.46

Spain for the actives—about 0.7 years over the entire period—and similar for wage earners—a rise of 0.8 years between 2002 and 2010. The comparison of the figures for the active population in the two countries also reveals a higher endowment of education in the Greek economy. At the beginning of the analysed period, there was a gap favourable to Greece of about 1 year (11.8 vis-à-vis 10.9) that increased over the time period to 1.4 years in 2012. The gap for wage-earners was even wider, particularly during the expansion (a maximum of 1.6 years in 2006).[5]

As for the regional differences in the individuals' endowment of education, Table 10.3 shows that average years of schooling in densely populated Greek regions, such as Attiki and Kentriki Makedonia, tend to be well above the levels in the less developed areas. Actually, the gap between these regions and Anatoliki Makedonia Ionia Nisia, or Sterea Ellada (as wide as about 2.5 years in some cases) confirms the existence of far from negligible differences across regions in the level of educational attainment. On the other hand, the evolution of the coefficient of variation for the regional endowments of education suggests that disparities remained stable over the period under analysis. In the case of the active population the coefficient takes a value of 0.06 in 2002 and 0.05 in the other 3 years, whereas for wage earners it amounts to 0.05 in 2002 and 0.04 in the other years. That is to say, there seems not to be a change in the degree of regional disparities in the level of educational attainment in Greece induced by the great recession.

A similar conclusion on regional disparities is derived from the information in Table 10.4 for Spain. Traditionally rich regions such as Madrid, the Basque Country, and Navarre are better endowed than the less developed areas in the southern part of the country (Andalusia, the Canary Islands, Extremadura, and Murcia). The gap between the regions with extreme values is between 1.5 and 2 years, depending on the period and the group of individuals, while the ranking is rather stable over the period under analysis. With respect to the evolution of the global level of disparities, the coefficient of variation for the years of schooling in the Spanish regions remains stable at 0.05 over the entire period for the active population, whereas it just shows minor changes for wage earners (0.06, 0.07, and 0.05 respectively for 2002, 2006, and 2010).

Summing up, the simple descriptive evidence in this section confirms that Greek and Spanish regions also differ in terms of the average endowment of education; but this time it appears that regional disparities in education endowments have remained stable during the expansive period and were not particularly affected by the crisis. In contrast, as should be expected, in both countries the educational endowment for wage earners went up with the crisis, reflecting the fact that employment opportunities (for salaried employment) increased for the more educated (relative to the rest) in both countries during the crisis—a result reflecting

[5]However, it should be kept in mind that the source of the Spanish data on actives is different to the one of wage earners. Despite using a similar methodology to compute the years of schooling in both cases, comparability cannot be guaranteed as the sample of wage earners does not include workers in firms with less than 10 employees in Spain. Therefore, the comparison should be made with caution.

some degree of sorting on the basis of education. This is something that we examine formally in the next section.

In particular, in the remainder of this chapter we move on to examine at the individual level the effect that education exerts on an individual's probability of unemployment and on her wage level across the different regions of Greece and Spain—thus departing from most of the previous literature, which has analysed this question using aggregate regional magnitudes. To do so, we revert to an econometric analysis using a human-capital approach involving the estimation of (a) probit regressions on the probability of unemployment and (b) a set of Mincerian wage regressions on individual wages. The next two sections present our estimation method and empirical results from these two sets of analysis.

10.5 The Regional Effect of Education on Unemployment

10.5.1 Empirical Model

The empirical specification is based on the idea that an individual i in region r is unemployed when her propensity of being in such labour status (U_{ir}^*) is above a threshold, that for simplicity it is set at 0:

$$U_{ir} = 1 \text{ if } U_{ir}^* = \beta^r Educ_{ir} + X_{ir}\delta^r + \mu_{ir} > 0$$
$$U_{ir} = 0 \text{ otherwise}$$

The propensity of unemployment is a latent variable and, thus, unobservable. Instead, we observed if the individual i in region r is unemployed ($U_{ir} = 1$) or not ($U_{ir} = 0$), depending on her propensity of being above or below the threshold. We assume that the propensity of unemployment for each individual in each region depends on a set of personal and household observable characteristics, grouped in X_{ir}, and on the level of individual's educational attainment, $Educ_{ir}$. Instead of imposing a uniform regional effect of education and the other observable characteristics on the propensity of unemployment, the empirical model includes specific coefficients for each region, β^r and δ^r. That is to say, the change in U^* caused by a 1-year increase in education is allowed to differ across regions.

The propensity of unemployment for individual i in region r also depends on unobservable characteristics that are captured by the random component μ_{ir}. Under the assumption of normality of this error term, the estimation of the effect of education on the probability of unemployment can be obtained by a probit model such as:

$$prob(U_{ir} = 1) = \Phi(\beta^r Educ_{ir} + X_{ir}\delta^r)$$

The estimates of the coefficients β^r and δ^r are used to compute the marginal effect of education for individuals in region r, defined as the change in the probability of unemployment that results from increasing the level of education by a year for these individuals while keeping all other individual characteristics at sample mean values.

The control variables included in X in the probit specification for the probability of unemployment are dummy variables for the gender, the nationality (native- versus foreign-born), the marital status (married versus other situations), being head of household, and having children under 9 years old. We also included as continuous variables the number of children (under 16 years old) in the household, the number of household members, and the number of members of the household that were employed other than the surveyed individual. The specifications used to obtain the estimates for the whole of Greece and Spain also included regional dummies.

10.5.2 Results

Our analysis produces a large number of results, which are difficult to report due to space reasons. Given our interest in the role of education, here we only report the marginal effects corresponding to the years of schooling, although the entire set of effects is available from the authors upon request. The results contain two main features: first, the contribution of education to lowering individuals' chances of unemployment appear to rise with the overall level of unemployment (especially over time) and is stronger in Spain than in Greece—suggesting an important role for labour market structure in the relationship between education and unemployment; second, regional differences in this contribution are quite large in both countries and both in periods of expansion and contraction—suggesting in turn an important role for the production structure and regional characteristics also outside the labour market.

The results of the estimate of the marginal effects of education in Greece and each of its regions are summarized in Table 10.5. For the country as a whole, an additional year of schooling contributed significantly to decrease the likelihood of unemployment in the 4 years under analysis. However, the magnitude of the effect evolved over time. It increased from −0.19 percentage points in 2002 to −0.22 points in 2006, and to −0.45 points in 2010. The reduction in the probability of unemployment reached a maximum of 1.1 percentage points in 2012, when the unemployment rate in Greece increased dramatically (see Table 10.1).

However, the significant total effect in the Greek economy hides outstanding regional variation in the impact of education on unemployment. This is clear from

Table 10.5 Marginal effect of schooling on the probability of unemployment in the Greek regions

	2002	2006	2010	2012
Anatoliki Mak.	0.0030**	0.0014	−0.0031	−0.0075***
KentrikiMak.	−0.0007	−0.0047***	−0.0052***	−0.0092***
Dytiki Mak.	−0.0039	−0.0134***	−0.0109***	−0.0189***
Ipeiros	−0.0005	−0.0022	−0.0033*	−0.0118***
Thessalia	0.0023	−0.0025	−0.0023	−0.0104***
Ionia Nisia	−0.0015	−0.0114***	0.0021	−0.0043
Dytiki Ellada	0.0001	0.0007	−0.0008	−0.0045
Sterea Ellada	0.0001	−0.0039**	−0.0027	−0.0072**
Attiki	−0.0017	−0.0050***	−0.0075***	−0.0105***
Peloponnisos	−0.0008	−0.0013	−0.0017	−0.0035
Voreio Aigaio	0.0004	0.0042	−0.0054*	−0.0100*
Notio Aigaio	−0.0042	−0.0021	−0.0052	−0.0032
Kriti	0.0022*	0.0017	0.0005	−0.0072***
Greece	−0.0019***	−0.0022***	−0.0045***	−0.0107***

Note: ***p<0.01, **p<0.05, *p<0.1

the maps in Fig. 10.1, where the size of the circles represents the magnitude of the marginal effect of education on unemployment, for those regions where it is statistically significant. Leaving aside results for 2002, in which the estimated effect is very small in all regions, and is even significantly positive in Anatoliki Makedonia and Kriti, we observe that the number of regions where education has a statistically significant effect on unemployment—which is thus also stronger than that estimated for the country as a whole—is rather limited. For instance, in 2006 the marginal effect was −1.34 percentage points in Dytiki Makedonia and −1.14 points in Ionia Nisia, but in 8 out of the 13 Greek NUTS2 regions, there were no differences in the propensity of unemployment between individuals with different levels of education, once controlling for other characteristics. A similar picture is derived from the estimates for 2010, though there are a few changes in the regions with a significant effect (Dytiki Makedonia, Kentriki Makedonia and Attiki are now the regions with the strongest coefficients). More interesting are the results for the last year under analysis, since the size of the reduction in the chances of being unemployed associated to the level of education increased substantially in all but one region (Notio Aigaio). Actually, in all but four regions the marginal effect is statistically significant for 2012, in contrast with what is observed for the previous years. Still, the generalized increase in the size of the effect did not prevent differences across regions in the impact of education in the last year under analysis. The estimated marginal effect equals −1.89 percentage points in Dytiki Makedonia and −1.18 in Ipeiros, whereas it is not significantly different from zero in Ionia Nisia, Dytiki Ellada, Peloponnisos, and Notio Aigaio.

To properly assess the extent of these disparities, it is useful to calculate the difference in the probability of unemployment for similar individuals who differ only in their level of education in various regions. In the case of Dytiki Makedonia

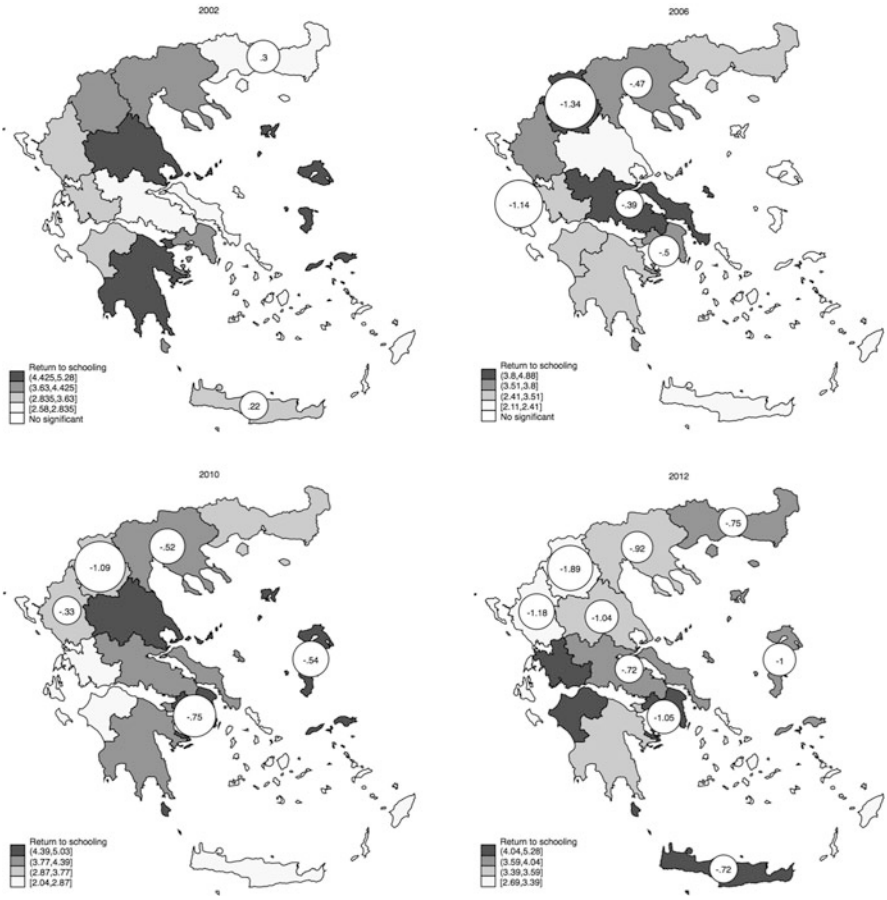

Fig. 10.1 Marginal effect of schooling on the probability of unemployment and wages, Greece

the average probability of unemployment for individuals with primary education was about 11 percentage points higher than that of individuals with similar characteristics but with the highest level of secondary education. Meanwhile, individuals with tertiary education faced a probability that was 9.45 points lower than that of the latter group.[6] In sharp contrast, in Ionia Nisia and the other regions mentioned above there was no difference in the probability of unemployment between similar individuals with primary, high secondary, and tertiary education, since the marginal effect of schooling is not statistically different from zero for these regions. This shows a peculiar dysfunction in those labour markets, as even with a substantial rise

[6]In computing the difference in the probability of unemployment between levels of education, we have used 6 years between primary and the high level of secondary schooling, and 5 years between the latter level and tertiary education. The figures in the text result from multiplying these amounts by the corresponding estimate of the marginal effect.

Table 10.6 Marginal effect of schooling on the probability of unemployment in the Spanish regions

	2002	2006	2010	2012
Andalusia	−0.0143***	−0.0110***	−0.0276***	−0.0286***
Aragon	−0.0014	−0.0024**	−0.0113***	−0.0147***
Asturias	−0.0028	−0.0022	−0.0105***	−0.0207***
Balearic Isl.	−0.0068***	−0.0042***	−0.0160***	−0.0213***
Canary Isl.	−0.0074***	−0.0072***	−0.0269***	−0.0197***
Cantabria	−0.0000	−0.0000	−0.0127***	−0.0172***
Castile Leon	−0.0041***	−0.0036***	−0.0154***	−0.0164***
Castile La Mancha	−0.0063***	−0.0063***	−0.0215***	−0.0261***
Catalonia	−0.0057***	−0.0040***	−0.0169***	−0.0184***
Valencia	−0.0050***	−0.0062***	−0.0219***	−0.0214***
Extremadura	−0.0177***	−0.0137***	−0.0226***	−0.0293***
Galicia	−0.0034**	−0.0024*	−0.0122***	−0.0149***
Madrid	−0.0026**	−0.0046***	−0.0133***	−0.0129***
Murcia	−0.0046**	−0.0063***	−0.0168***	−0.0176***
Navarre	−0.0002	−0.0049***	−0.0098***	−0.0107***
Basque C.	−0.0050***	−0.0043***	−0.0111***	−0.0109***
La Rioja	−0.0054**	−0.0041**	−0.0126***	−0.0130***
Spain	−0.0066***	−0.0058***	−0.0181***	−0.0196***

Note: ***p<0.01, **p<0.05, *p<0.1

in unemployment, as shown earlier, education continues to be non-influential in sorting individuals between employment and unemployment.

Regarding the results of the effect of education on unemployment in Spain and its regions, these are summarized in Table 10.6. The estimated effects confirm a negative relationship between the two magnitudes, which seems to be stronger in 2010, when unemployment rates were much higher than in previous years. An additional year of education decreased the likelihood of unemployment in Spain as a whole by 0.66 and 0.58 percentage points in 2002 and 2006 respectively. The effect rose to 1.81 percentage points in 2010 and to 1.96 points in 2012. Compared with the effect of education in Greece, the magnitude of the reduction in the probability of unemployment associated to an additional year of schooling in Spain appears much higher both during the expansive period and once the crisis started hitting the two countries. As a matter of example, the contribution of an additional year of education in reducing the probability of being unemployed was almost twice in Spain than in the Greek economy at the end of the period under analysis—suggesting that education functions as a signal and/or a sorting mechanism, much more effectively in Spain than in Greece.

In any case, estimates of the marginal effect for the Spanish regions, depicted in the maps in Fig. 10.2, reveal that the impact of education on the propensity of unemployment was far from regionally uniform. In 2002, the effect in Andalusia and Extremadura stood at −1.43 and −1.77 percentage points, whereas no

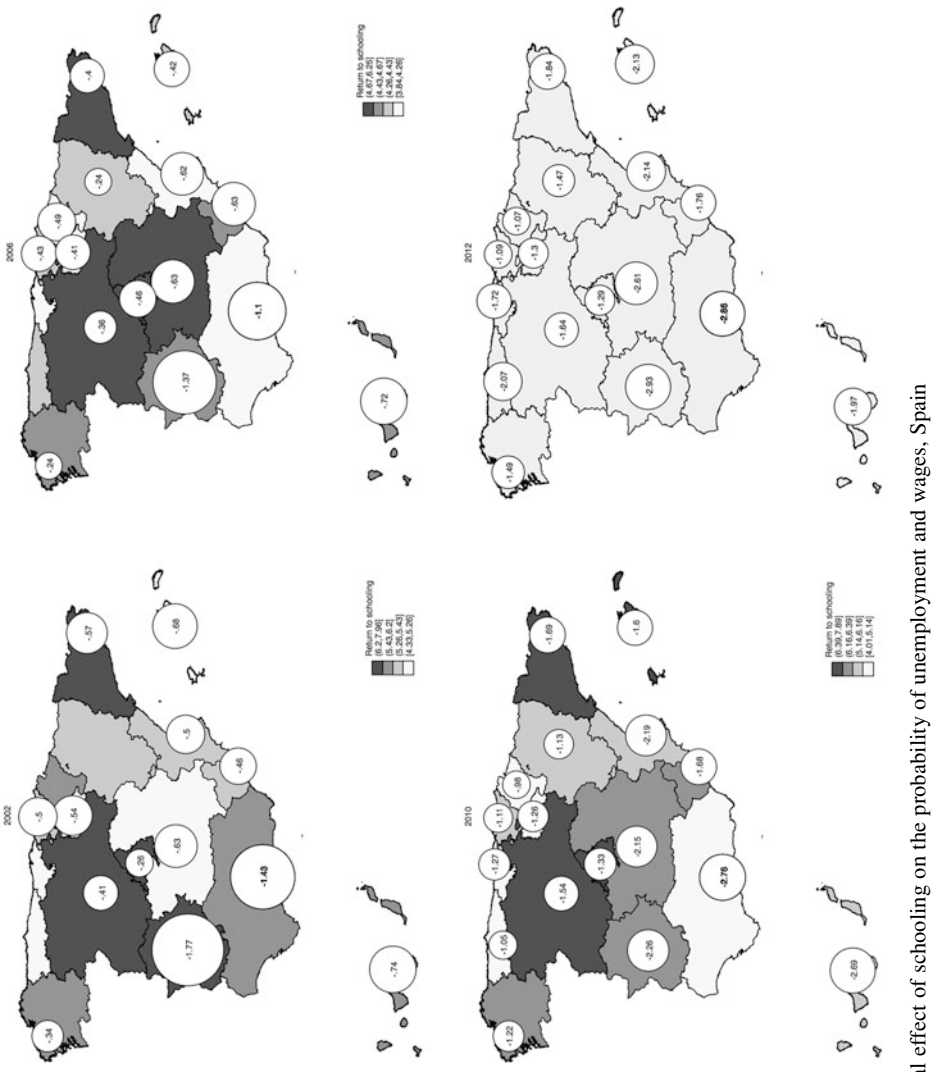

Fig. 10.2 Marginal effect of schooling on the probability of unemployment and wages, Spain

significant impact of education was observed in regions such as Aragon, Asturias, Cantabria and Navarre. A similar pattern in the regional distribution of the effects is observed for 2006, although again there are some changes in the group of regions with no significant effects.

In turn, the sizeable increase in the effect of education on the likelihood of unemployment is observed for all regions in 2010. But, once again, the regions with the highest rates of unemployment are those with the largest magnitude for the marginal effect of education. An additional year of education is associated with a reduction in the probability of unemployment close to 3 percentage points in Andalusia, the Canary Islands, and Extremadura. In addition, the size of the effect in 2010 is also clearly above the country-average in other regions whose labour market was particularly reactive to the early stages of the crisis, such as Castile La Mancha and Valencia. The magnitude of the effect rose in regions with the most dynamic labour markets as well, but to values that are about one third of the ones mentioned above (around 1 percentage point in Aragon, Asturias, Navarre, and the Basque Country). Finally, the results in Table 10.6 reveal that, with few exceptions, the size of the effect of education continued increasing in 2012. The rise is particularly intense in Asturias (where the effect of education doubled with respect to that estimated for 2010, from −1 to −2 percentage points), the Balearic Islands, Cantabria, Castile La Mancha, and Extremadura. In contrast, a reduction is observed for the Canary Islands, whereas values in the other regions have remained rather similar for the last 2 years under analysis.

All in all, the evidence from the estimates of the marginal effect of education on the likelihood of unemployment in the Spanish regions indicates that the magnitude of the effect evolved with the business cycle and with the rate of unemployment. It also confirms that the effect on the likelihood of unemployment of the individuals' endowment of education varies greatly across regions. As in the analysis of the results for Greece, it is useful to calculate the difference in the probability of unemployment for similar individuals who differ only in their level of education in various regions. For example, in 2012 the average unemployment probability of individuals with primary education in Extremadura was 17 percentage points higher than that of individuals with similar characteristics but with the highest level of secondary education. In turn, individuals with tertiary education faced a probability that was 14 points lower than the one of the latter group. These same differences in the case of Navarre were 6 and 5 percentage points respectively. This represents a far from negligible regional difference in the effect that education has on the likelihood of unemployment, even when compared to the actual unemployment rates observed in each region.

Summing up, the results for Greece and Spain point to a large regional heterogeneity in the effect that education has on individuals' propensity to be unemployed. Although intuitively one would expect that first- and second-nature geography factors may be responsible for this heterogeneity (e.g., location/accessibility and specialisations/production structure, respectively), it is particularly interesting to note that the magnitude of the effect is greatest in those regions (and years) where unemployment rates are higher. This is consistent with the view

that education acts as a sort of insurance against unemployment, or a sorting device when the economy is far from its full-employment equilibrium, the effect being stronger in regions that suffer most from imbalances in the labour market. In those cases, the possession of education favours individuals with a high endowment of education, presumably both because they are more productive and because they are more likely to be employed in occupations and sectors less affected by job losses.

Nevertheless, the comparison of results for Greece and Spain, particularly in 2012 when the unemployment rates were similar in the two countries, indicates that the benefits associated with higher education are larger in the Spanish labour market. Differences in the transmission mechanisms of the crisis in the two countries may at least partly account for this differential between Greece and Spain. In Greece, the crisis originated from, and affected more, the public sector, where levels of education are typically higher—thus releasing a relatively highly-educated workforce which was unable to find alternative employment in conditions of austerity and economic depression. In Spain, the crisis emerged predominantly in the construction sector, thus affecting predominantly—at least in the first instance—the less educated segment of the workforce. At least to some extent, however, the difference ought to be due also to more substantive differences in the functioning of the labour markets of the two countries—especially as the differential appears in our data well before the eruption of the crisis. In this line of explanation, it would appear that the demand for educated labour in Spain, relative to the supply of educated workers, is stronger than in Greece. Whether this represents evidence of a healthier skilled-job creation in Spain, or of over-education in Greece, is something that we cannot examine with the available data—although both explanations seem plausible. In this vein, it is also important to note that the regional differences in the derived conditional probabilities are much larger than the observed regional differences in levels of education. This suggests that, as far as education is concerned, unemployment differentials across regions have more to do with the ability of the regional labour markets to utilize the available labour force skills (as proxied by years of schooling) than to attract and retain such skills. In other words, regional differences in the education endowment are a less prevalent explanation of regional unemployment differentials compared to regional differences in the effective use of the educational stock endowed to each region.

10.6 The Regional Effect of Education on Wages

10.6.1 Empirical Model

As noted earlier, the estimate of the effect of schooling on wages in each of the regions is obtained by means of a Mincerian wage equation in which the (log) wage of individual i in region r, w_{ir}, depends on the years of schooling, $Educ_{ir}$, and a set

of other observed characteristics, grouped in Y_{ir}, that in one way or another affect productivity:

$$\ln(w_{ir}) = a^r + \tau^r Educ_{ir} + Y_{ir}\varphi^r + \varepsilon_{ir}$$

where a^r is a region-specific intercept and ε_{ir} is the error term that accounts for the effect of unobservable factors affecting the wage of worker i in region r. The return to a year of education in a region r is given by the τ^r coefficient, which is estimated from the equation above using the sample of private-sector wage earners in region r, for each of the years analysed (i.e., excluding public-sector employees).

Following common practice, our vector of observable characteristics Y_{ir} includes variables that are typically hypothesized to affect productivity or to capture the accumulation of productivity gains during one's work-history. This includes variables measuring labour market experience and job-tenure (years since leaving continuous full-time education and years since started on the present job, respectively)—both included in both linear and quadratic form to capture the diminishing character of this accumulation process. It also includes a dichotomous male/female variable, to account for the known differences in wages between genders, that is to say the lower wages earned by women in comparison with their male counterparts.

Despite the availability of information on other characteristics, such as occupation, firm size and industry, in the SES and the LFS datasets, our choice has been to use this parsimonious specification presented above and not to include in our analysis these additional variables. This is because, as also indicated in some previous literature (e.g., Pereira and Martins 2004), such variables typically included in what is often referred to as 'extended Mincerian wage equations' are in fact *the channels* through which workers with more education obtain the return to their educational investment. In this sense, including them in our regressions would tend to 'over-explain' the observed wages and thus to under-estimate the full returns to education which is the object of our analysis. By using the parsimonious Mincerian specification, we are able to measure regional differences in the returns to education that are due to all possible factors, including factors such as differences in occupational and sectoral structures, in firm sizes, and so forth. It should be noted, however, that in any case, the findings that we obtain with our parsimonious specification are qualitatively very similar to the ones we obtain when we extend our model to include controls for more characteristics: generally, as should be expected, the estimation of wage equations incorporating these other characteristics results in lower estimates of the return to education; however, this effect is quite horizontal across regions and thus the conclusions drawn about regional differences are not altered. We turn to the discussion of our findings next.

10.6.2 Results

Similar to what was found for the case of unemployment, our results for the case of the wage returns to education suggest a relative decline in booming years and

intensification during the crisis. This is consistent with the view of education operating as a sorting mechanism, which is less intensive when the economy is closer to full employment but becomes stronger in times of slack. Additionally, however, and again as was the case before, returns (and thus the sorting mechanism associated with education) appear to be stronger in Spain than in Greece, across the business cycle; while regional disparities in these returns also appear to be larger in the case of Spain than in Greece.

We present the summary results for our estimated returns to education, for each region and year analysed, in Table 10.7 for Greece and Table 10.8 for Spain. For the Greek economy as a whole, the estimated return to education declined marginally from 2002 to 2006 (3.8% and 3.5% respectively), rose quite fast in 2010, to slightly above 4%, and continued to rise, albeit moderately, in 2012 to 4.3%. Therefore, the return to schooling in the private sector of the Greek economy decreased during the economic boom and rose during the recession. However, as is clear from the maps in Fig. 10.1, which are based on the information from Table 10.7, this estimate for the entire country hides interesting regional variations, in connection with both the magnitude of the return and its evolution over the period. It is observed that, in 2002, the return to schooling in Thessalia and Voreio Aigaio was above 5%, far beyond the return in Anatoliki Makedonia (2.6%) and Ionia Nisia (1.7%, non-statistically significant). A gap of a similar magnitude is also observed between the regions with the highest and lowest returns in the other 3 years under analysis, despite the particular evolution of the return in each region. As a matter of example, the return in Sterea Ellada shows a dramatic increase in 2006, up to 4.9% from 2.7% in 2002, whereas the percentage in Voreio Aigaio decreased from 5.2% to 1.1% (a value that it is not statistically different from zero). Sizeable changes are observed also for 2010, whereas the figures for 2012 suggest that the intensification

Table 10.7 Return to schooling in the Greek regions

	2002	2006	2010	2012
Anatoliki Mak.	0.0258***	0.0325***	0.0377***	0.0367***
Kentriki Mak.	0.0366***	0.0365***	0.0405***	0.0359***
Dytiki Mak.	0.0368***	0.0477***	0.0309***	0.0339**
Ipeiros	0.0358***	0.0361***	0.0296***	0.0274***
Thessalia	0.0528***	0.0238***	0.0455***	0.0358***
Ionia Nisia	0.0170	0.00435	0.0287***	0.0285**
Dytiki Ellada	0.0360***	0.0351***	0.0204***	0.0458***
Sterea Ellada	0.0274***	0.0488***	0.0439***	0.0404***
Attiki	0.0416***	0.0380***	0.0503***	0.0528***
Peloponnisos	0.0469***	0.0337***	0.0425***	0.0344***
Voreio Aigaio	0.0521***	0.0108	0.0445***	0.0364**
Notio Aigaio	0.0266***	0.0211***	0.0247***	0.0269**
Kriti	0.0293***	0.0241***	0.0286***	0.0421***
Greece	0.0382***	0.0347***	0.0417***	0.0427***

Note: ***p<0.01, **p<0.05

Table 10.8 Return to schooling in the Spanish regions

	2002	2006	2010
Andalusia	0.0573***	0.0422***	0.0514***
Aragon	0.0543***	0.0430***	0.0522***
Asturias	0.0480***	0.0438***	0.0506***
Balearic Isl.	0.0496***	0.0443***	0.0686***
Canary Isl.	0.0582***	0.0451***	0.0616***
Cantabria	0.0433***	0.0418***	0.0498***
Castile Leon	0.0622***	0.0492***	0.0648***
Castile La Mancha	0.0526***	0.0508***	0.0629***
Catalonia	0.0644***	0.0539***	0.0662***
Valencia	0.0532***	0.0426***	0.0582***
Extremadura	0.0776***	0.0464***	0.0621***
Galicia	0.0620***	0.0467***	0.0639***
Madrid	0.0796***	0.0625***	0.0789***
Murcia	0.0533***	0.0450***	0.0627***
Navarre	0.0594***	0.0401***	0.0433***
Basque C.	0.0535***	0.0427***	0.0552***
La Rioja	0.0448***	0.0384***	0.0401***
Spain	0.0608***	0.0485***	0.0635***

Note: ***$p<0.01$

of the crisis in 2011/12 did not cause an increase in the return to education in the majority of Greek regions. On the contrary, for almost all regions, the estimated return in 2012 is similar and in some cases even lower than the one obtained for 2010. Actually, results show that the moderate increase in the return to education nationally during this period was driven by the rise in the return of just a couple of regions, Dytiki Ellada and Kriti. In any case, as already mentioned above, the crisis does not seem to have affected the amount of regional disparities in the wage return to schooling in Greece.

As in the case of the results regarding regional disparities in the impact of education on unemployment, it is useful to compare the change in the wage level, in different regions, of similar workers that just differ in the level of educational attainment. As in that case, we have computed the wage gap between workers with primary, high secondary and tertiary education (which corresponds to differences of 6 and 5 years of schooling, respectively). The results for 2012 reveal that in Attiki the wage earned by a worker with high secondary education was 32% higher than that earned by a similar worker with primary education. In turn, in 2012 a worker with tertiary education in that region earned a wage that was 26% higher than the similar worker with high secondary schooling. These differences are far more pronounced than those in the Greek region with the lowest return to schooling. In Notio Aigaio, the wage of the representative worker with tertiary education was 13% higher than that with high secondary, whereas the latter earned 16% more than the representative worker with only primary education.

The estimates of the return to schooling in Spain and its regions are in Table 10.8. For the whole of Spain, the return is estimated at 6.1% in 2002, falling to 4.6% in 2006. This drop of around a third in the wage increase associated with an additional year of education, in the short period of 4 years, probably has its origin in the peculiar circumstances of the labour market in Spain in this period, particularly in sectors such as construction, and in the high level of over-qualification of the workforce. However, the impact of the economic crisis seems to have changed that trend, since the estimate of the return for 2010 grew to 6.4%, which is a level above the one observed in 2002. Therefore, the evolution of the return to schooling in Spain was similar to that in Greece, although the magnitude of the changes observed within the period under analysis are larger in Spain than in Greece. The effect of education on wages seems to be also much higher in Spain, particularly in 2002 and in 2010 (50–60% higher). It will be interesting to compare the returns for 2012 when the Spanish data become available. If there was a further increase in the return in Spain in 2012 as a result of the deepening of the recession, it could be the case that the gap in the return would have widened even further. Interestingly, the distance between the two countries in the estimated returns is lower at the peak of the boom period.

The same trend over the decade is observed for each of the Spanish regions, although there are some differences in the intensity of the drop in the first part of the period and of the increase after the impact of the crisis. For example, the estimated value for 2010 in the Balearic Islands lies well above that obtained in 2002, while in Extremadura the increase between 2006 and 2010 was not large enough to counterbalance fully the decrease in the first part of the last decade, leading to a value for the return in 2010 that is clearly below that in 2002. In any case, the results in Table 10.8 and the corresponding maps in Fig. 10.2 confirm that the regional heterogeneity in the return to education in Spain is far from negligible, being observed both in periods of growth and recession. In 2002, the return was close to 8% in regions as different among them as Madrid and Extremadura. In contrast it was just between 4% and 5% in the Balearic Islands, Cantabria and La Rioja. The gap lessened slightly in 2006, with Madrid and Catalonia showing the highest return (6.3% and 5.4%, respectively), and Navarre and La Rioja the lowest (around 4%). The latter two regions were also at the bottom of the list in 2010, partly as a result of the limited increase in the return since 2006. At the top, Madrid still leads the ranking in the last year analysed, with a return of about 8% (similar to the one at the beginning of the decade).

To end with the discussion on the results regarding the regional estimates of the return to schooling in the Spanish regions, it is worth mentioning that the wage gap between workers with primary and high secondary education in Madrid in 2012 was close to 50%, whereas that for workers with tertiary and high secondary education was 40%. The corresponding gaps were much narrower in La Rioja, of 24% and 20% respectively. Therefore, these figures confirm that, as in the case of Greece, there are considerable disparities between Spanish regions in the effect of the individual's endowment of education on the wage she earns. Again, however, these differences appear much higher in Spain than in Greece.

Beyond the regions that lead or close the list of the returns to schooling in the two countries, our aim with the figures in Tables 10.7 and 10.8 has been to show the different impact that education has on the wage earned depending on the region in which the individual works. Overall, the evidence from the two countries confirms that there are notable disparities in the return to education made by individuals earning a wage in each of these regions, which add to the disparities discussed in the previous section in reference to the effect of education on the propensity to be employed or unemployed. Moreover, the high regional heterogeneity in the return to education suggests that regional differences in wage levels in the two countries are not explained solely by differences between regions in the endowment of education, but also by differences between regions in the wage rewards associated to any given level of education.

10.7 Concluding Comments

There are two main issues that our analysis in this chapter sought to examine. On the one hand, the labour market responses to the boom-and-bust cycle of the last decade and the particular role played in this by education. On the other hand, the regional differentiation in labour market outcomes (wages, unemployment) and fundamentals (education endowment), including the role that education plays in intermediating these outcomes at the regional and national level (marginal effect on the probability of unemployment and wage returns to education). Further, by examining these issues jointly for two southern European countries that have been severely affected by the crisis, we were able to gain insights about the relative importance of these factors in a comparative fashion.

The starting point of our analysis was the examination of the regional dispersion and temporal evolution of unemployment rates and average private-sector wages in our two study-countries. In line with what is known from previous studies (Petrakos and Psycharis 2004; Monastiriotis 2011, 2014; López-Bazo and Motellón 2012, 2013), labour market outcomes have been found to vary markedly across regions in both Greece and Spain. Although the crisis seems to have instigated a process of convergence (albeit marginally so), disparities have been sizeable throughout the 2000s and remain so today. This suggests quite clearly a disequilibrium condition in both countries, with employment opportunities and salaried incomes being persistently unequal across space—which in turn is bound to reflect problems in the functioning of equilibrium mechanisms, such as migration, cross-regional capital flows, and the cross-regional transmission of price signals.

Levels of education have also been found to be quite diverse across space in both countries, although here the differences are not so pronounced as in the case of wages and unemployment. In a way, this finding acted as a direct motivation for our subsequent analysis, which focused on the role, not of individual characteristics, but of the returns to these characteristics—in the form of contributions both to the incidence of (un)employment and to an individual's wage compensation. These two

variables (wages and unemployment) are obviously related both at the individual and the aggregate level; but for our analysis here they represent essentially two aspects of labour market success, one relating to the quality of a job (wages) and the other to the probability of securing a job in the first place (unemployment). Our analysis has clearly demonstrated that the contribution of education to these measures of labour market 'success' varies widely across regions in both countries.

Interestingly, however, there are some notable differences between the two countries in the role (and perhaps also in the extent) of education in the labour market. Greece appears to have slightly higher averages in terms of years of schooling, both in general (active population) and in its private-sector salaried employees. At the same time, however, education in Greece appears to have a much more muted role in sorting people between employment and unemployment and in determining the level of wages received by each wage-earner. Indeed, even at the height of the crisis (in 2012), where one would expect labour market sorting to be at its strongest, in five out of the 13 Greek NUTS2 regions education appears to play no statistically significant role in directing people into employment—while nationally it only makes a marginal contribution to an individual's employment chances. This contrasts starkly with the case of Spain, where an additional year of education appears to lower the unemployment probability of an individual by 2 percentage points—or by between 1.0% and 2.8%, depending on the region where the individual is located.[7]

As noted earlier, these differences may be attributable to two sets of factors. On the one hand, the particular transmission mechanisms of the crisis in the two countries: in Spain, the crisis came predominantly through the low-skill sector (mainly construction), thus disproportionately hurting the lower-educated, who experienced faster rises in unemployment and larger reductions in their wages; in contrast, in Greece the recession came through the austerity measures implemented by the government, which were more horizontal, or even progressive, in nature, thus affecting in the first instance the more educated by far. On the other hand, and especially under the light of the observation that country differences in the wage-returns and unemployment-penalties of education existed also well before the crisis, a more plausible explanation for these differences seems to be one concerning the vibrancy of labour demand and of skilled-job creation in particular. In this line of thought, the relatively weaker role of education in the Greek labour market may be taken to signal an over-representation of low-quality/low-education jobs in the economy, at least relative to the level of educational qualifications available in the workforce. This interpretation is also supported by the cross-regional evidence, in both countries, where we find that the returns to education (in terms of both wages and employment probabilities) are typically higher in regions of more vibrant labour demand and a higher technological content in their production mix (e.g., industrial

[7]Similar differences are found for the case of the wage-returns to education, although, as noted earlier, in this case our results are not directly comparable due to differences in the composition of the relevant samples and the measurement of the wage variable.

and metropolitan regions). This seems to indicate directly that structural (e.g., sectoral specialisations) and functional characteristics of the regions play an important role in the contribution of education in determining labour market 'success', either directly or through their effect on the functioning of the regional labour markets and of the vibrancy of labour demand there. The importance of this is amplified when considering the fact that actual differences in levels of education, both between countries and across regions, are generally rather marginal.

In closing, a comment is due on the role of education in the adjustment process in the regional economies of the two countries studied here. As has also been shown elsewhere, in both countries unemployment rates have increased substantially with the crisis, somewhat faster in Spain and slightly later in Greece, but in both cases reaching rates nearing or surpassing a quarter of the active population. In contrast, the adjustment of wages has been much slower and smaller, with wages in Greece declining somewhat compared to 2010 but generally remaining well above their pre-crisis levels (e.g., compared to 2006) and wages in Spain being still higher in 2010 (the last year for which we have relevant data) compared to 2006 (even in real terms). This, despite significant wage cuts regulated in the Greek economy and the natural downward pressure on wages that one would expect to take place given the vast rise of unemployment in both countries. Quite evidently, this may be taken as a signal of poor functioning of essential labour market adjustment mechanisms in the two countries, and in particular of wage adjustability (flexibility) both across space and over time—although it is also partly accounted for by compositional changes in salaried employment (e.g., a sharper decrease in the number of salaried workers at the bottom of the wage distribution during the crisis).

Combined with the previous conclusion about the nature of labour demand, it appears to us that our analysis, although descriptive in nature, has allowed us to reveal some key labour market issues and weaknesses, particularly in Greece but also in Spain. In both countries, labour market adjustment in response to the crisis has taken place significantly more on the quantity side (unemployment) rather than through prices (wages). In both countries, education has played a role in mediating the impact of the crisis (i.e., helping, in relative terms, individuals with more years of schooling), but this role has not been even across space and has generally functioned better in regions which already possessed some advantages in terms of production structure and levels of development. And in both countries, the high incidence of unemployment does not appear to be so much related to regional handicaps in terms of actual educational endowments as it is related to an apparent inability, in most Greek regions and in a large number of Spanish regions, to sufficiently utilize the educational endowment available to each region. In this sense, and as a general conclusion emanating from our analysis in this chapter, it seems that addressing the problems of unemployment (nationally) and regional disparities (in labour market performance more generally) in our two study-countries (and perhaps more broadly, in the European South) would more likely require policies targeting the *functioning* of the labour market rather than ones

focusing on the human capital *endowments* of these countries and their regions. In essence, given the spatially disparate and generally low (especially in Greece) effect that education has been found to have on labour market outcomes across our two samples, it appears that an educational endowment deficit (at least in terms of quantity) is not amongst the main weaknesses of the labour markets studied here—and that, thus, efforts aimed at addressing the pressing issues of unemployment and declining wages ought to be directed more towards appropriate labour market and industrial policy interventions, i.e., policies concerning labour mobility, the regional transmission of price signals, and the qualitative upgrading (in terms of both resilience/diversification and skill-content/knowledge-intensity) of existing production structures.

Acknowledgments The authors wish to acknowledge financial support from the European Community's Seventh Framework Programme (FP7-SSH-2010-2.2-1) under grant agreement n° 266834, SEARCH Project. EL-B and EM wish also to thank the support of the Spanish Ministry of Economics and Competitiveness, National Program of R&D, under the project ECO2014-59493-R.

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