Lancaster University Management School

Economics Working Paper Series

2019/007

Spatial Variations and Clustering in The Rates of Youth Unemployment and Neet: A Comparative Analysis of Italy, Spain and the UK

Steve Bradley, Giuseppe Migali and Maria Navarro Paniagua

LUMS home page: http://www.lancaster.ac.uk/lums/

SPATIAL VARIATIONS AND CLUSTERING IN THE RATES OF YOUTH
UNEMPLOYMENT AND NEET:

A COMPARATIVE ANALYSIS OF ITALY, SPAIN AND THE UK

April 2019

DRAFT

Steve Bradley, Giuseppe Migali and Maria Navarro Paniagua

ABSTRACT: We investigate the 'determinants' of spatial variations in youth unemployment and NEET rates, and the presence of spatial clusters, for Italy, Spain and the UK. Using Labour Force Survey data for the period 1993-2011 at a 'regional' level we obtain broadly consistent measures of quarterly youth unemployment and NEET rates. Our findings suggest that youths are sensitive to aggregate labour market conditions with older youths being more cyclically sensitive than are teenagers. We find a discouraged worker effect, again larger for older youths than for teenagers. In the UK and Spain, temporary jobs are preferred to part-time jobs, perhaps as a way of avoiding unemployment, whereas in Italy the opposite occurs. There is evidence of spatial clustering of youth unemployment and NEET rates. Our paper concludes with a discussion of the implications for regional and labour market policies.

1. INTRODUCTION

The youth unemployment experience of OECD countries over time has been very varied. In a recent review of OECD country experience, Scarpetta et al (2010) show that over the period 1995-97 to 2005-07 Italy and Spain had experienced higher than average youth unemployment rates, but they had also witnessed the greatest decline over the decade. In contrast, Britain had lower than average youth unemployment rates but had experienced higher than average increases. Typically, however, the level and amplitude of the youth unemployment rate exceeds that for adults. In 2008, the youth-adult unemployment ratio was 2.8 for the OECD area, but ranged from 1.5 in Germany to between 3 and 4 in Denmark, Italy, Korea and United Kingdom, and above 4 only in Sweden and Spain (Scarpetta et al, 2010). Spain had by far the largest youth-adult unemployment ratio. A number of researchers have also documented the fact that young people are disproportionately affected by recessions, and the 'Great Recession' in 2007-08 was no exception, where the effects in Italy were particularly severe.

High rates of youth unemployment are a major policy concern because of the potentially long-term damaging effects, or 'scarring effects', such as a higher likelihood of repeat unemployment, lower future earnings and possible detachment from the labour market. Gregg (2001) shows for the UK that an additional 3 months unemployment before the age of 23 leads to an extra 2 months of unemployment or inactivity between the ages of 28 and 33. De Fraja, Lemos and Rockey (2017) also show that unemployment shocks occurring during the ages of 18-20 causes a permanent income loss of 2% with some differences for men and women, and much greater scarring effects for the less able. Gregg and Tominey (2005) also found for the UK that one year of unemployment at the age of 22 led to a wage penalty of 13-21% twenty years later. Policy makers have also recently become interested in the numbers of young people who are neither employed, in education or in training – the so-called NEET group, who are disengaged from both the labour market and the education and training system.[1] This group comprises the unemployed but also the economically (and educationally) inactive, although an agreed definition has proved elusive (Maguire, 2015). Since this group do not engage in any form of meaningful human capital accumulation, it is likely that the scarring effects referred to above will be at least as great, and possibly greater, for the NEET group. However, although

---

[1] The term NEET emerged in the UK in the 1990s following the introduction of changes to unemployment benefit regulations for young people in 1988, the outcome of which was the removal of 16-18 year olds from the unemployment statistics (Maguire, 2015). The term is now used across the EU.

the literature on youth unemployment is substantial, that on the NEET group is relatively small. Few studies investigate spatial variations in youth unemployment within countries and there are no studies, which we are aware of that analyse the effect of spatial clustering on youth unemployment and NEET rates. Indeed, Maguire (2015) argues that the formulation of appropriate policy for the NEET group in particular is hampered by a lack of information on how many young people are in this group and where they are located. One could also add to this the need to understand how the size of this group varies over time.

The aim of the current paper is to try to fill this gap in the literature by seeking to identify the 'determinants' of variations in youth unemployment and NEET rates between regions within countries and over time in order to gain a better understanding of potential causal mechanisms. Variations in unemployment rates between regions within countries are much greater than either disparities between countries or variations over time within countries. By comparing the experience of several countries, we seek to uncover 'common factors' at work in determining regional disparities in youth unemployment and NEET rates in different countries. Youth labour markets are also dynamic insofar as young people tend to move in and out of unemployment (and probably NEET) more frequently than their adult counterparts, suggesting that we examine within year variation in youth unemployment and NEET rates.

The unemployed and economically inactive tend to be concentrated in particular regions and sub-regions, which implies a need to also account for possible spatial autocorrelation in youth unemployment and NEET rates. For instance, Armstrong and Taylor (1988) and Martin (1996) document the persistence of unemployment rates in the north of England, Scotland, Wales and NI when compared to the Midlands and southern regions of England. This paper seeks to identify the effect of spatial clustering of youth unemployment and NEET rates. A second objective of the paper is therefore to analyse the spatial mechanisms that lead to correlation in the unemployment and NEET outcomes of the regions of each country.[2]

To achieve these objectives, we use individual 'worker' level LFS data, collected quarterly, for each country for the time-period 1993-2011, which we aggregate to the regional level for Italy, Spain and the UK. By using LFS data, we are able to account for a richer set of covariates.

With regards to our choice of countries, the persistence of regional disparities in adult unemployment rates in the three EU countries chosen for this study are well known (Taylor

---

[2] An early study of spatial autocorrelation in unemployment rates in the UK context is Molho (1988).

and Bradley, 1996; Bande, Fernandez and Montuenga, 2007; Bande, 2014; see also Zeilstra and Elhorst, 2014), however, this cannot be said with respect to their youth unemployment and NEET rates. The three countries are also interesting in their own right and have had very different unemployment experiences. Scarpetta et al (2010) show that Italy, Spain and UK are clustered at the upper end of the OECD league table for the percentage of youths inactive and NEET, exceeded only by Turkey and Mexico. Indeed, in 2014 and 2015 two Spanish regions (Castilla-La Mancha and Andalucia) and one Italian region (Calabria) had youth unemployment rates in excess of 60 percent in either of these two years (Moller, 2017). Furthermore, the magnitude of youth unemployment rates and their dispersion is highest in Italy, Spain and Greece and at intermediate levels in Britain, for instance (Moller, 2017).

Our econometric results suggest that there are a number of common factors which increase youth unemployment and NEET rates, especially in the cases of Spain and the UK. For instance, the all age regional youth unemployment rates tend to rise when adult unemployment increases, and this group is more sensitive to aggregate labour market conditions than the teenage group. A more muted effect is apparent with respect to the NEET group, which is expected, given that this group contains a higher proportion of discouraged workers. There is also some evidence that a larger percentage of immigrants in a region increases youth unemployment rates in the UK and Spain, especially for teenagers. A further common finding is that industry mix and the percentage of SMEs in a region serve to reduce youth unemployment rates, reflecting demand-side effects. Our evidence is mixed with respect to the size of the regional youth population, and with respect to our measure of the stock of human capital in the region. There is also evidence that in the case of the UK and Spain there is a positive spill over effect between regional youth unemployment rates, whereas in the case of Italy the effect is negative. The difference in findings for these countries implies something about the level of interdependence between regions with respect to industry linkages and trade.

Our paper is structured as follows. In the following section, we discuss the previous literature, followed in Section 3 by a description of our data. We present summary statistics on the persistence of spatial variations in youth unemployment and NEET rates, the spatial pattern of youth unemployment and NEET and the relationship between youth unemployment and NEET rates for the three countries. Section 4 presents our econometric model, that is, a spatial autocorrelation model of youth unemployment and NEET rates. This is followed in Section 5 by a discussion of our results and we end with our conclusions.

2. A REVIEW OF THE LITERATURE

Models of spatial disparities in the unemployment rate distinguish between equilibrium and disequilibrium causes. Equilibrium causes include demographic factors, such as the proportion of youths or females in the labour force, as well as other factors like industry mix and the stock of human capital (Lopez-Bazo and Artis, 2005). Equilibrium approaches suggest that regions have different underlying mean unemployment rates, and 'asymmetric shocks' simply move regions temporarily away from these mean values but eventually regions converge back and regional unemployment relativities are restored (Blanchard and Katz, 1992). Supply-side explanations, such as the role of unions, benefit systems and worker preferences for local amenities and climate (Marston, 1986), are suggested to explain why regions do not return to some equilibrium level. In contrast, the disequilibrium approach suggests that regional disparities in unemployment persist because labour market adjustment mechanisms are weak. In the EU context, low geographical mobility and real wage rigidities are often blamed for this, and mean that unemployment disparities are 'history dependent' (Martin, 1996).

In terms of the countries under investigation here, Ammermuller, Lucifora, Origo and Zwick (2010) show for Italy (and Germany) that the long-run 'equilibrium' relationship between the level of wages and the level of regional unemployment differs among regions and groups of workers within countries, particularly with respect to gender, skill level, and the position of workers in the wage distribution. For instance, they argue that labour market attachment varies spatially within Italy, and females in the south are less attached than males, possibly due to the lack of job opportunities. Similarly, workers at the lower end of the wage distribution, such as youths, are more likely to leave the labour market and become inactive rather than accepting lower wages should unemployment increase in the region. There have been a number of studies of regional unemployment for Spain, primarily because it has experienced some of the highest unemployment rates amongst OECD countries. For example, Lopez-Bazo and Artis (2005) find that equilibrium factors drive regional unemployment rates in Spain, placing particular emphasis on the unequal distribution of amenities. The regional distribution of the youth population is another key factor. Silva and Vazquez-Grenno (2013) also highlight the important role of fixed term jobs in determining flows into unemployment. Similarly, Green and Livanos (2013) analyse the increase in involuntary non-standard (i.e. part time and/or temporary) employment pre- and post-Great Recession for UK regions, with the largest increases observed for the peripheral regions of the North and Northern Ireland. Young

people and females are more likely to take this type of job and are therefore more likely to have a higher risk of unemployment and NEET.

There have been very few studies of spatial variations in youth unemployment and NEET rates. Nevertheless, several determinants of youth unemployment and NEET rates can be identified in the literature. First, the youth unemployment rate is more pro-cyclical than the adult unemployment rate and youths suffer more during recessions. Using regional level data for the EU, Moller (2017) shows that a 1 percentage point rise in the adult unemployment rate leads to a 2 percentage point increase in the youth unemployment rate. He investigates the impact of 'youth structural factors' in determining this sensitivity of youth to adult rates of unemployment, and notes the importance of country specific factors. Italy is shown to be one of the countries with the highest sensitivity to cyclical shocks. Bruno, Marelli and Signorelli (2014) investigate the determinants of spatial variations in regional youth NEET in the EU rates, and draw comparisons with respect to youth unemployment and adult unemployment rates. They place particular emphasis on the impact of the Financial Crisis and consequent Great Recession. They show that NEET rates are persistent, falling as regional economies grow, as one would expect, but exhibited less persistence during the crisis period. It is also shown that regions in the southern parts of the EU (e.g. Italy) have more persistent NEET rates and that there is a 'spatial propagation' of NEET rates between contiguous regions. These differences in the pro-cyclicality of youth to adult unemployment rates are likely to reflect demand shocks wherein firms respond by cutting recruitment, especially in branch plants, and/or adopting 'last-in-first-out' redundancy policies, both of which disproportionately affect younger workers. If wages are rigid downwards, which is possible due to the presence of strong unions, or overly generous benefit systems, then youth unemployment and NEET rates will rise, suggesting that youths bear the brunt of business cycle fluctuations (see Canziani and Petrongolo, 2001; Jimeno and Rodriguez-Palenzuela, 2003; Bertola, Blau, and Kahn, 2007; Kahn, 2007; Modesto, 2008; and Kawaguchi, 2011).[3]

Young people also tend to concentrate in certain cyclically sensitive industries, and, as we have shown above, are more likely to be in non-standard employment, such as involuntary temporary and part-time jobs. Given the uneven distribution of cyclically sensitive industry

---

[3] Kelly and McGuinness (2015) investigate the determinants of the incidence of youth unemployment and NEET pre- and post- the Great Recession, and also investigate changing patterns in transition behaviour. They use individual longitudinal data from Ireland's Quarterly National Household Survey 2006: Q2 (boom) to 2011: Q2 (recession). They find statistically significant 'regional' effects, which vary between unemployed youths, the NEET group and prime aged adults, and by the stage of the business cycle.

and of non-standard employment, it is likely that demand shocks will have an uneven spatial impact. However, Perugini and Signorelli (2010) find for western regions of the EU that higher shares of primary and construction industry do not have a statistically significant effect on regional youth unemployment rates, whereas a higher share of manufacturing industry reduces youth unemployment. Traditional services benefit females only.

Turning to the supply side, there has long been a view that less educated and less skilled youths will face a higher risk of unemployment, hence regions with a higher share of these groups are likely to have higher youth unemployment and NEET rates (Scarpetta et al, 2010). The OECD *Jobs for Youth* review identified two groups that face particular difficulties in getting a stable job after leaving school: one group are labelled the "youth left behind" and the other are referred to as the "poorly-integrated new entrants". The former are those young people who lack qualifications, come from an immigrant or minority background and live in disadvantaged or remote backgrounds. According to Scarpetta *et al* (2010) the size of the 'youth left behind' group can be proxied by the number of young people in NEET. All countries are seen as having a group of "youth left behind", whereas the number of "poorly-integrated new entrants" is particularly large in Italy and Spain, along with France and Greece. Poorly integrated youths tend to move between unemployment, inactivity and temporary work and may have some qualifications and work experience. Quintini and Manfredi (2009) show that those countries with a strong apprenticeship system and/or a less regulated labour market, such as Germany and the United Kingdom, tend to have more young people who perform well in the labour market because they have vocational qualifications, or because they can more easily move between unemployment and jobs. However, Scarpetta *et al* (2010) also argue that the difference in employment rates between those young people with tertiary and lower secondary education is more compressed in Spain and Italy than in Britain, which implies they also have higher graduate unemployment rates.

Reviewing the previous literature on the relationship between the share of youths in the workforce and other labour market outcomes, Korenman and Neumark (2000) argue that increases in the share of youths is associated with an increase in youth unemployment rates relative to the adult unemployment rates. However, Shimer (2001) adopts a state-level analysis, and shows that an increase in the youth share of the workforce reduces the youth unemployment rate, with an estimated elasticity of -1.5. Shimer suggests that one reason for this difference in the findings is that most previous work has ignored the relationship between the share of youths and the prime age unemployment rate, which he shows to be important. Perugini and Signorelli (2010) also investigate the impact of the share of young people in a region, which is shown to

be statistically insignificant, however, they do find evidence of spatial dependence, reflecting spill over effects between youth unemployment rates in neighbouring regions. These findings imply that it is important to investigate the spatial interdependence of 'regional' labour markets.

3.   DATA AND DESCRIPTIVES

We use data from the Italian, Spanish and UK Quarterly Labour Force Surveys for the period 1993-2011. Each of these datasets contains random samples of the workforce in the respective countries over 5 consecutive quarters.

The UK Labour Force Survey (LFS) is a household sample survey conducted on a quarterly basis, each quarter containing information on approximately 80,000 households and 120,000 individuals. In each quarter, there are five waves of respondents, which are included in the survey five consecutive times. New waves replace those waves that have been sampled in five consecutive quarters, which means that there is an 80% overlap of observations between consecutive quarters. Similarly, the Spanish Labour Force Survey is a rotating quarterly survey with a sample size of approximately 65,000 households per period and around 180,000 individuals. The sample is divided into six rotation groups, and the sixth group is renewed each quarter, which means that in any two consecutive quarters there are five overlapping rotation groups and five sixths of the sample in any two consecutive quarters can be matched. The Italian Labour Force Survey is also a quarterly survey, but with a 2-2-2 rotating pattern. Households participate for two consecutive quarters, and then they exit for the following two quarters, coming back into the sample for next two consecutive quarters. Hence, 50% of the households, interviewed in a quarter, are re-interviewed after three months, 50% after twelve months, and 25% after nine and fifteen months.[4] The target size of the annual sample is 286,144 households, however, in each year a new sample of approximately 71,000 sets of four households (corresponding to a total of 286,144) is drawn in order to compensate for non-responding households.

We aggregate individual level data to the regional level by year by quarter so that we end up with a panel of regions observed quarterly for the time-period 1993-2011. It is important to use quarterly data because of the dynamic (and seasonal) nature of youth labour markets in

---

[4] The LFS sample used from 2004 was re-designed in order to satisfy the Eurostat requirements contained in Council Regulation 577/98. However, the general structure of the sample did not change.

most countries. These data allow us to construct a number of personal and household variables, as well as distinguish between young people and adults. However, we also map on to each region variables reflecting industrial structure and GDP growth rates, for example. Table A1 in the Appendix provides descriptive statistics for all variables.

There is some dispute about the definition of youth and of the NEET group. In terms of the definition of youths we start with the 16-24 age group, however, we also identify the 'teenage' group (aged 16-19), which includes school leavers, who often face particular difficulties in making the transition from school to the labour market. Older youths (aged 20-24) and teenagers are likely to exhibit different behaviour in the labour market, with teenagers moving more often between jobs education and NEET, as well as being less geographically mobile. Young adults are likely to have more work experience and accumulated human capital. For each group, we adopt the LFS definition of unemployed as those young people who are '…actively seeking work in the last 4 weeks and willing to accept a job offer at the market rate…' As suggested in the Introduction, there is some discussion on the definition of the NEET group. Generally, we regard them as the unemployed plus the so-called 'economically inactive', where the latter includes the following young people:

- Spain – the inactive are those young people who are potentially active, including those not motivated, but excluding the following groups - students, retired or pre-retired, housewives or disabled individuals who are not available for work.
- Italy – the inactive are those young people who are: looking for their first job, housekeepers, out of labour force but looking for a job, out of labour force not looking for a job but available to work, and those out of the labour force but not currently available to work.
- UK- the inactive are those young people who are economically inactive but looking for, or willing, to work excluding the retired and those individuals who are looked after and/or injured.

This approach to defining the NEET category allows as much consistency between each country as possible, so that we can be sure that we are comparing like with like.

Table 1 provides some descriptive evidence of the magnitudes of youth unemployment and NEET rates for the regions of Italy, Spain and the UK. This table reports the best five and the worse five regions for each country based on the rate of youth unemployment (15-24 years). It also compares this rate to the NEET rate. It is clear that there is considerable variation

between regions within countries in terms of youth unemployment rates and NEET rates. For instance, in Italy there appears to be a clear north-south divide – in regions such as Campania and Sicilia almost one in two young people are unemployed whereas in Trentino-Alto Adige and Veneto, for instance, it is between one and two in ten youths that are unemployed. Youth unemployment in the worse performing regions of Spain are slightly higher than the worse performing Italian regions, however, the best performing Spanish regions have much higher youth unemployment rates than the best performing Italian regions. There are also wide variations in youth unemployment rates between the UK regions with Inner London and other parts of the North being the hardest hit.

NEET rates are more similar in magnitude in the different countries. NEET rates in Italy are smaller and the variation between the best performing regions and the worse performing regions is much wider than in the UK and Spain. The NEET rates in the best performing regions of Italy are in the north, at around 10 per cent, with the exclusion of Trentino Alto-Adige, a small region with special status. In the south of Italy, the NEET rate reaches a peak in Sicily at 26 per cent, followed by Campania and Calabria where the rate is slightly smaller. In Spain, the picture varies from one out of ten youngsters not in education, employment or training in Navarra, which is the best performing region in terms of employment, to one in four in Andalucia, which is the worst performing region in terms of employment. In the UK, it moves from 1.5 out of ten in the best employment performing regions to one in 4 or 5 in the worst employment performing regions.

Figure 1, which focuses on a single year for illustration, shows that there is a strong correlation between (all age) youth unemployment rates and adult unemployment rates.[5] Regions in the top right of the figure clearly have significant youth and adult unemployment problems. As shown in Table 1, Spanish regions exhibit the worst youth and adult unemployment problems with the UK the least affected; Italian regions overlap to a certain extent but the best performing Italian regions are comparable with the best performing UK regions.

Figures 2-6 investigate changes over time in the experience of regions with respect to youth unemployment and NEET rates. It is worth noting that the period 1995-97 is meant to capture a period of 'boom' whereas the period 2008-11 captures the Financial Crisis and Great Recession (hereafter the 'recession') which followed, albeit for different durations in each country. In the case of Spain (Figures 2 and 3), there is a clear upward shift in youth

---

[5] Table A2 in the Appendix provides a description of each acronym used in the Figures.

unemployment rates in the recession, but this is less pronounced for the NEET groups. It is also instructive to compare the experience of particular regions, for instance, Pais Vasco (PV) had experienced falling youth unemployment rates in the 1995-97 period, which was more than offset by a substantial increase in its youth unemployment rate in the recession period (Figure 2). Region Asturias (AS), in contrast, had experienced no change in its youth unemployment rate in the early period followed by a very substantial increase during the recession period. NEET rates for the two regions also increased but these were much less substantial (Figure 3).

The UK (Figures 4 and 5) experience can be characterised as more diverse with regions being far more spread, and changes in youth unemployment and NEET rates were much smaller in magnitude when compared to Spain. Again, it is instructive to highlight the diversity of experience by referring to particular regions. Merseyside (Mer) experienced a substantial reduction in its youth unemployment rate during the period 1995-97, which was partially offset by a subsequent increase during the recession period (see Figure 4). Interestingly, its NEET rate (Figure 5) there is a small change during the two periods but note from Table 1 that it is one of the worse performing regions with respect to youth unemployment and NEET rates. This implies persistence. In contrast, Wales experienced almost no change in its youth unemployment rate in 1995-97 but was substantially affected by the recession. A similar story emerges with respect to its NEET rate.

Figures 6 and 7 present the experience of Italian regions, which can be characterised as falling somewhere between the Spanish and UK experience. Regions such as Liguria (Lig) and Molise (Mol) appear to have experienced little change in youth unemployment rates, and are not the worst performing regions in Italy, whereas Campania (Cam) was effected quite severely during the recession period seeing youth unemployment rates increase by around 13 percentage points. Liguria (Lig), Molise (Mol) and Campania (Cam) also have quite different experiences with respect to NEET rates (Figure 7), with Campania (Cam) being the worst affected.

In summary, the descriptive analysis in Table 1 and Figures 1-7 show that there are significant differences in the youth unemployment and NEET experiences within and between countries. Responses to the 'recession' also differ. This variation needs to be borne in mind when we investigate the determinants of youth unemployment and NEET rates, especially given our aim to identify 'common' determinants.

Table A1 reports the means and standard deviations for all of the covariates used in our empirical models.

4. EMPIRICAL FRAMEWORK

4.1 Statistical models

Our econometric strategy has two parts. The first part involves the estimation of a simple OLS model for each country, including covariates that are suggested by the literature, in addition to those that we can generate from each LFS. An example is the percentage of immigrants in the region. We also estimate a model with regional dummies to capture differences in climate and amenities. Thus, we estimate models of the form:

$$U_{ith} = \alpha + \beta U_{th}^a + \rho X_{ith} + \mu_{ih} + \tau_t + \varepsilon_{ith}, \qquad (1)$$

where U_{ith} is our measure of the youth unemployment rate of region i in year t in country h, U_{th}^a is the national adult unemployment rate for country h, at time t. The vector X includes other variables that capture equilibrium determinants of regional youth unemployment rates, such as industry mix, the number of Small and Medium Sized Enterprises (SMEs) in the region, as well as measures of the stock of human capital and measures of competition for jobs. These latter variables include the percentage of married females over 24 years of age in the region and the percentage of immigrants. μ_{ih} are unobserved region specific fixed effects capturing amenity effects and the effects of climate. τ_t are time dummies for each quarter and ε_{ith} is a mean zero, normally distributed random error. The models of the NEET rate are specified identically to those models for the youth unemployment rate.

The second part of our econometric strategy is based on the estimation of a spatial autoregressive panel model (Anselin, 2008), which takes the following form:

$$U_{ith} = \alpha + +\gamma WU_{-ith} + \rho X_{ith} + \mu_{ih} + \tau_t + \varepsilon_{ith}, \qquad (2)$$

where $WU_{-i,th} = \sum_{j \neq i} \omega_{ij} U_{jth}$ is the weighted average unemployment rate of the neighboring region j at time t in country h; ω_{ij} are exogenously chosen weights that aggregate the unemployment rate of neighboring regions into a single variable $WU_{-i,th}$. The ω_{ij} are

normalized so that $\sum_{j \neq i} \omega_{ij} = 1$. X_{ith} is a matrix of demographic as well as measures of industry mix of region i at time t in country h. Equation (2) has a more parsimonious specification when compared to equation (1), excluding, for instance, the national adult unemployment rate. μ_{ih} are unobserved region specific fixed effects, τ_t are time dummies for each quarter and ε_{ith} is a mean zero, normally distributed random error.

In equation (2), the coefficient γ measures the spatial interdependence in the regional unemployment, which is the reaction of the unemployment rate of a given region to a one per cent increase in the average unemployment rate of its neighbours.

4.1 Identification of the spatial model

The average neighbouring unemployment rate WU_{-ith}, is endogenous because unemployment interactions are symmetric and simultaneous: the behaviour of each region's unemployment rate directly affects that of its neighbours and it is similarly affected by their behaviour. These effects can arise because of the trade 'linkages' between industries in spatial clusters, which results in a common response to economic shocks, and because of competition for jobs, particularly from adults, in neighbouring regions. Therefore, the OLS estimation of equation (2) is inappropriate as it generates biased estimates. Thus we adopt an instrumental variable approach, where at the first stage the endogenous variable WU_{-ith} is instrumented by the weighted average of the proportion of young people in the neighboring regions, $WY_{-ith} = \sum_{j \neq i} \omega_{ij} Y_{jth}$. Our maintained hypothesis is that, in a given region, the variation in the number of young individuals has a direct effect on the unemployment rate of that region but it does not significantly affect the neighbouring regions' rates of unemployment. Essentially, we assume that the number of young people in region *j* do not compete for jobs in region *i*, because they are less mobile than their adult counterparts, due to income constraints with respect to transportation, or because they are less likely to migrate from high unemployment to low unemployment regions. This is likely to be the case for the teenage group in particular, however, there is evidence that older youths are more likely to live with parents for longer, especially in Italy (around 88 per cent of those aged 16-29) and Spain (Billari, 2004; Iacovou, 2001). Finally, we turn to the specification of the weighting matrix. It is obtained using contiguity weights, defined as ω_ijh=1/n_ih where n_ih is the number of regions contiguous to i in country h, and ω_ijh=0 if regions are not contiguous. These weights capture the idea that spatial interactions are only between geographically neighbouring regions and therefore local governments are likely to react only to what their geographical neighbours do.

To reiterate we estimate equation (2) for all four dependent variables: teenage unemployment rates (16-19), all age youth unemployment rates (16-24) and the NEET rate counterparts. Table A2 provides a definition of each variable included in our models.

5. RESULTS

5.1 The determinants of spatial variations in youth unemployment and NEET rates

The effects of the business cycle: To pick up the effects of the business cycle, and hence demand shocks, on youth unemployment and NEET rates we include as a covariate the national adult unemployment rate. Recall that young people who are new entrants to the labour market (i.e. 16-19 year olds) may be at the back of the labour queue and may be the victims of LIFO redundancy policies implemented by firms, which means that they are more sensitive to business cycle fluctuations, especially downturns. Table 2 shows that there is evidence of a statistically significant relationship between national adult unemployment rates and regional rates of youth unemployment for 16-19 year olds (teenage rates), except for Italy. In Spain, an increase in the national adult unemployment rate of 1% leads to a 2.3% increase in the regional teenage youth unemployment rates, whereas in the UK, the effect is much smaller and suggests that teenagers are less sensitive to aggregate labour market conditions. In terms of the total youth group (16-24 year olds), a different story emerges (see Table 3). For this group, there is consistent evidence across countries of a statistically significant and positive correlation between the national adult unemployment rate and youth unemployment rates. The effects are larger for Spain and Italy but smaller in magnitude than the teenage effect in Spain. In all three countries, total youth unemployment is far more sensitive to changes in aggregate demand conditions. As demand falls, reflected by the increase in national adult unemployment rates, youth unemployment increases by more, suggesting that older youths are more cyclically sensitive than are teenagers.

In terms of the NEET rate, there is evidence of a positive relationship between the national adult unemployment rate and teenage regional NEET rates in Spain and in Italy when we control for regional fixed effects (and similar in magnitude – see Table 4). These effects are lower than the effects for the teenage unemployment rate (see Table 2). Table 5 reports the findings for the 16-24 group, where a consistent pattern is observed – as adult unemployment rises, the 16-24 NEET rate also rises but the amplitude is less. Taken together, the results for

14

teenagers and all youths implies the presence of a discouraged worker effect, which is more pronounced for older youths than it is for teenagers. One possible explanation for this is that teenagers may see further education as a more desirable option than dropping out of the labour market, simply because of the fact that they have more recently completed their compulsory education. However, it is also the case that because amplitude of the NEET rates are less than 1, this implies that fewer young people drop out of the labour market into economic inactivity when the economy is slack.

Overall, these findings suggest that different groups of young people respond in different ways to business cycle effects, and there is some variation between countries.

The effect of competition for jobs: In this section, we investigate the effect of competition between sub-groups of the labour force for jobs. Young people face competition from each other for available jobs, however, they have often faced competition from married females who have been willing over time to take on 'entry level' jobs. More recently, young people may have faced increased competition for jobs from immigrant workers, especially with respect to less skilled jobs, which implies larger effects for teenagers. There is a consistent story from Tables 2-5 - the higher the percentage of married females in a region the lower the youth unemployment and NEET rates are, implying that young people are actually ahead of married females in the jobs queue. These effects are larger in the case of Italy but of smaller magnitude for the NEET groups. For Italy, these effects could reflect the cultural factors, as suggested above, whereas for the UK and Spain the reasons are less clear-cut. Note, however, that the effect of married women on youth unemployment and NEET rates tends to become much smaller, changes sign or becomes statistically insignificant when regional fixed effects are included. This implies that regional amenities may play a role.

In terms of competition from immigrant workers, the LFS data only enables us to measure the size of this group in each region of the UK and Spain. The estimated effects in Tables 2 and 3 suggest that a higher percentage of immigrants in a region, the greater the increases in regional youth unemployment rates, and this effect is larger for teenagers when compared to the total youth group. In terms of NEET, Tables 4 and 5 also show that a higher percentage of immigrants in a region increases the NEET rate, although the size of these effects shows less variation between Spain and UK, and between different youth groups. We should note, however, that these effects are only statistically significant when we include regional fixed effects, which implies a spatial dimension to their impact. In sum, these results do suggest

that either immigrant workers out compete young workers, or young workers are unwilling to accept some types of jobs that they are qualified for.

The quality of jobs: We include two variables to try to capture the effect of job quality on regional youth unemployment and NEET rates. The first is the percentage of the regions' workforce in temporary jobs and the second is the percentage in part-time jobs. Both of these factors have been investigated in the previous literature, and for young people at least, can be regarded as more 'marginal' jobs in terms of the prospects and wages.

With respect to teenagers (see Table 2), there is a negative and statistically significant effect of temporary jobs on their unemployment rate for the UK and Spain when we include regional fixed effects, whereas for Italy the effect is positive. This implies for the former that teenagers do see temporary jobs as a way of avoiding unemployment. There is very little evidence of an effect for the total youth group (see Table 3), except in the case of Spain. For Italy, the effects for both groups are positive and statistically significant, suggesting that youths do not see temporary jobs as an acceptable route into the labour market, and so the larger the percentage of temporary jobs in a region the higher their unemployment rates. In terms of NEET, Table 4 shows the effect for Italy is consistent with the effects on the unemployment rate, insofar as teenagers are more likely to drop out of the labour market the larger the share of temporary jobs in a region. A similar effect is observed for the all age youth group (see Table 5). Teenagers in the NEET group in the UK, respond in a similar way to Italian youths (see Table 4). In summary, the availability of temporary jobs leads to different responses amongst youths, depending on the country and the age group.

There is little evidence of an effect of part time jobs on unemployment rates, however, the larger the percentage of the workforce in a region in part time jobs, the higher the NEET rate is in the UK and Spain (see Tables 4 and 5). The reverse is the case for Italy. This suggests a clear ordering of preferences by young workers vis-à-vis job quality. In the UK and Spain, temporary jobs are preferred to part time jobs whereas in Italy the reverse is the case. Presumably, the differences in the response of NEET rates to job quality reflect an evaluation by young people of the relative merits of part time and temporary jobs in helping them with respect to career progression.

The effect of skills and education: As a measure of the stock of highly educated and most likely highly skilled workers in the region, we use the percentage of youths in the workforce with a higher education qualification. Regions with a greater stock of higher educated workers should

have lower rates of youth unemployment and NEET. This is because such workers are likely to be in greater demand by employers, are hoarded during economic downturns and are one attractor for inward investors. Of course, it is also possible that highly educated youths are competitors for unqualified youths, especially teenagers.

Our evidence on the effect of the stock of human capital on youth unemployment and NEET rates is mixed. For the UK, there is evidence that the greater the stock of highly educated youths in a region, the higher the rate of teenage unemployment (Table 2), whereas there is a negative effect for the all age youth unemployment rate when we include regional fixed effects (Table 3). The findings with respect to teenage unemployment rates suggest that some workers out compete the less qualified for available jobs. The fact that we do not observe a similar effect for the 16-24 age group implies that this group of workers have more experience and compete more effectively in the regional labour market. For Spain, we only observe a statistically significant and negative effect for the all age group. A different picture emerges for Italy – a higher stock of highly qualified youths in a region reduces youth unemployment rates for both teenagers and older youths, regardless of whether we include regional fixed effects or not.[6] Education and training therefore matters. Thus, although highly educated youths do compete for jobs with other highly educated workers, having a degree does reduce the risk of youth unemployment for the 16-24 age group. For all three countries, a more highly educated youth workforce reduces NEET rates, hence helping to mitigate discouraged worker effects, which is consistent with our findings on youth unemployment rates.

The effect of industry mix and labour demand: We include in our model a variable to capture the percentage of regional employment in manufacturing and construction industry in an attempt to capture the availability of jobs that have typically been entered by young people. The size of the SME sector in each region is also included for similar reasons.[7]

Regions with a higher percentage of the workforce employed in the manufacturing and construction reduces youth unemployment in all countries for both teenagers and the total youth group, except for Spain where the effect is statistically insignificant for teenagers. These effects are largest in Italy and smallest in the UK, and the size of these effects fall when we include

---

[6] But note that in Italy in absolute terms there are fewer HE graduates in Italy than in the UK and Spain, so reducing the stock. Also, the average age of graduation in Italy is also relatively high, around age 24, so this group is less likely to be in direct competition with youths for jobs. Thus, when the number HE undergraduates increases, this reduces labour supply at lower ages thereby reducing youth unemployment.

[7] We omit the SME variable for Italy because it is not measured in a way comparable to the UK and Spain, and leads to very large constant terms implying that there is a measurement problem with this variable.

regional fixed effects. In terms of the effect of the availability of SMEs as a source of youth employment, a larger number of such firms in a region has a statistically significant negative effect on total youth unemployment in the UK, but no significant effect for teenagers when we include fixed effects (see Table 2). These results imply that a larger SME base in the region is useful in reducing unemployment amongst the 20-24 age group. The effects for Spain are statistically insignificant, or mis-signed, especially when we include fixed effects. A different picture emerges with respect to the NEET rate insofar as a larger SME base in the region reduces juvenile NEET rates in Spain and the UK, but not for all models.

Overall, a larger number of small and medium sized firms in a region, the lower the NEET rate, however, the weight of evidence suggests that it is the 20-24 age group that benefits most. One explanation could be that these young people possess more experience, which SMEs are likely to require – recruiting teenagers who would require training is a cost that many SMEs could not afford.

The effect of youth labour supply: Above we discussed the possible effects of the supply of young workers on youth unemployment rates. Table 2 suggests that there is evidence that a higher percentage of youths in the working age population has a positive effect on teenage unemployment rates, the exception being Spain where the effects are statistically insignificant. The evidence for Italy is mixed insofar as a positive effect is only observed once we control for regional fixed effects. For the total youth group (see Table 3), there is also evidence for the UK, and to a lesser extent Spain, that a higher percentage of youths in the region drives up youth unemployment rates, implying an excess supply of youths. In terms of the NEET rate, there is systematic evidence that a larger percentage of youths in the region increases the teenage NEET rate in all three countries. The largest effects are observed for the UK and Spain when we include fixed effects. For Italy, we only observe a statistically significant effect when we include fixed effects. There is evidence of a similar effect for the total youth group (see Table 5), however, this is less robust than the evidence for teenagers and the effects are smaller.

5.2 Spatial clustering of youth unemployment and NEET rates

In this section, we report the results from estimating Equation 2 in section 4. Our objective in this section is to investigate whether there is any evidence of spatial clustering in youth unemployment rates and NEET rates, and how this clustering varies between Italy, Spain and the UK. Recall that we treat unemployment rates and NEET rates in neighbouring, or

contiguous, regions as endogenous (termed a 'spatial neighbour effect'). To overcome this problem, we use the neighbouring regions youth labour supply as an instrument, because this is determined by birth rates and net migration flows, for instance. We also disaggregate our analysis by teenagers and young adults since the previous analysis has shown that these two groups behave differently. Tables 6 to 9 show the results for the spatial autoregressive model, and its instrumented version together with the first stage.

In Table 6, we report the estimates of youth unemployment for the 16-19 year old group. For the UK, the spatial AR coefficient, reported in the first column, is positive and significant, and suggest that a 10 per cent increase in the youth unemployment rate in the neighbouring regions increases the regional rate by around 2.5%, this effect rises to 3.4% in the IV model (column 3). For Spain, we observe similar effects although slightly larger in magnitude, for example looking at the second stage (column 6) the increase in youth unemployment is around 6%, still assuming a 10% increase in the neighbours' rates. For Italy, the spatial AR coefficient is small and not significant, however, after instrumenting this becomes negative and statistically significant.

Considering the 16-24 year old group, see Table 7, the spatial AR estimates for the UK are bigger than those observed for the younger group - a 10 per cent increase in the neighbouring youth unemployment rate increases the regional rate by around 5%. For Spain, however, the effect for the all age group is smaller when compared to the teenage group, and we note that in second stage (column 6) the AR coefficient is 0.22, which corresponds to a 2.2% increase if the neighbouring rates rises by 10%. For Italy, again, we have contrasting results between the OLS spatial AR model and the IV model. In fact, when controlling for the endogeneity of the spatial coefficient it becomes negative and reduces the regional youth unemployment.

Overall, the effects suggest that variations in the youth unemployment rates in the neighbouring regions has significant effects on the regional youth unemployment rate for each country. The effects are relatively high; recall that increases in youth unemployment rates are large over time. It is also worth noting that our instrumental variable in the first stage regression – the log of the number of young people - is statistically significant and positive, and the LM test suggests it is a valid instrument.

In Table 8, we show the results for the NEET rates of the 16-19 year old group. The spatial AR coefficient for the UK doubles once we control for endogeneity (from 0.2 to 0.4), suggesting that a 10% increase in the neighbours NEET rate increases the regional NEET rate by 4%. When looking at the 16-24 year old group, Table 9, the effect of the neighbours NEET

rate is still positive and significant but a bit smaller in size. For Spain, we observe a substantial increase in the effect of the neighbours NEET rate when moving from the OLS to the IV model, column 6 in Table 8 shows an increase of almost 10% in the regional NEET rate, for a 10% increase in the neighbour's rate. This increase is not confirmed for the 16-24 year old group in Table 9, but it is in line with the previous results (around 0.32). For Italy the effects on NEET rates are similar to those observed with respect to youth unemployment rates, for both the 16-19 and 16-24 age groups. In the IV models, both in Table 8 and 9, the second stage shows a negative impact of the neighbours NEET rate of around 0.2, that is 2% decreases for a 10% increase in the neighbouring regions. For all countries, the first stage results confirm the goodness of the instrument used.

For the UK and Spain, the estimated effects suggest a statistically significant positive effect of neighbouring regions unemployment and NEET rates on region i's unemployment and NEET rates. For Italy, the effects are negative and statistically significant. The spatial neighbour effects are slightly larger for spatial neighbour unemployment rates when compared with the effect of spatial neighbour youth NEET rates. This is expected, given the fact that the NEET group includes those young people who are not engaged in any form of employment, education or training, and who are presumably discouraged workers. Finally, the estimated effects of the spatial neighbour variables (not reported) tend to be larger after we use an IV technique, suggesting that it is important to allow for the potential endogeneity bias.

In sum, there is clear evidence of spatial clustering of youth unemployment and NEET problems, the latter suggesting a spatial clustering of discouraged workers. Why do we observe these effects? There are several possible reasons. First, in the case of the UK and Spain, the spatial agglomeration of industry is likely to play a part insofar as spatially peripheral regions tend to have a higher preponderance of cyclically sensitive firms who trade with one another. In the case of Italy, where several regions are heavily clustered in a North-South divide, there may be less trade between industries hence clusters in the North, for instance, are 'independent' of clusters in the South. Second, clusters of high unemployment or NEET youths may be unattractive to domestic or foreign companies considering where to locate. This is compounded by the fact that these areas also tend to have a smaller pool of highly qualified youths, for instance.

5. CONCLUSIONS

In this paper, we have two objectives. The first objective is to investigate the determinants of regional variations in youth unemployment and NEET rates. Specifically, we investigate the determinants of quarterly regional unemployment and NEET rate differences for Italy, Spain and the UK for the period 1993-2011. A second objective of the paper is to assess whether there is spatial neighbour effect of contiguous youth unemployment and NEET rates on a region's youth unemployment or NEET rates. Given the likely differences in labour market behaviour, we disentangle the effects for teenagers from total youth groups. To achieve these objectives, we use individual 'worker' level LFS data, collected quarterly, for each country for the time-period 1993-2011, which we aggregate to the regional level. By using LFS data, we are able to account for a richer set of covariates.

Our econometric results suggest that there are a number of common factors, which increase youth unemployment and NEET rates, especially in the cases of Spain and the UK. For instance, the all age regional youth unemployment rates tend to rise when adult unemployment increases, and this group is more sensitive to aggregate labour market conditions than the teenage group. A more muted effect is observed with respect to the NEET rate, which is to be expected given that this group contains a higher proportion of discouraged workers. There is also some evidence that a larger percentage of immigrants in a region increases youth unemployment rates in the UK and Spain, especially for teenagers. A further common finding is that industry mix and the percentage of SMEs in a region serve to reduce youth unemployment rates, reflecting demand-side effects. Our evidence is mixed with respect to the size of the regional youth population and our measure of the stock of human capital in the region. There is also evidence that in the case of the UK and Spain there is a positive spill over effect between regional youth unemployment rates, whereas in the case of Italy the effect is negative. The difference in findings for these countries implies differences in the level of interdependence between regions with respect to industry linkages and trade. Of course, since 2012 unemployment rates have fallen, especially in the UK, however, the prospect of a hard BREXIT may reverse this trend.

Our findings raise obvious implications for spatial economic and labour market policies, which need to be targeted and focused. Providing structured work experience and training to reconnect young people in NEET is a priority, otherwise there is a risk of developing clusters of permanently excluded groups in society. Research has shown that overcoming early deficits in human capital can be overcome over time. However, it is also imperative that

governments at all levels seek to influence the demand side of their regional economies. Attracting inward investment is a tried and tested route, however, assistance with the creation of SMEs, and support for their growth, is also important. The concern, of course, is that local governments and quangos in all three countries are resource constrained due to austerity measures. A general improvement in each country's national economy will help, as our results show, but this is unlikely to improve all regions equally.

REFERENCES

Anselin, L. (1988) *Spatial econometrics: methods and models*, Kluwer Academic Publishers, Dordecht.

Ammermuller, A., Lucifora, C., Origo, F. and Zwick, T. (2010) Wage flexibility in regional labour markets: Evidence from Italy and Germany, *Regional Studies*, 44, pp401-421.

Armstrong, H. and Taylor, J. (1988) *Regional Policy and the North-South Divide.* Employment Institute, London.

Bande, R. (2014) Spanish regional unemployment revisited: The role of capital accumulation, *Regional Studies*, 48, pp. 1863-1883.

Bande, R., Fernandez, M. and Montuenga, V. (2007) Regional Disparities in the Unemployment Rate: The Role of the Wage-setting Mechanism in Spain, 1987–92, *Regional Studies*, 41, pp. 235-251.

Bertola, Giuseppe., Blau, Francine D., and Kahn, Lawrence, M. (2007). "Labor market institutions and demographic employment patterns" *Journal of Population Economics*, 20, 833-867.

Billari, F. (2004). Becoming an adult in Europe: A macro/micro-demographic perspective. *Demographic Research*, *3*, 15–44.10.4054/DemRes.2004.S3.2

Blanchard, O. and Katz, L. F. (1992) Regional Evolutions, *Brookings Papers on Economic Activity*, No. 1, pp. 1-76.

Bruno, G., Marelli, E and Signorelli, M. (2014) The rise of NEET and youth unemployment in EU regions after the crisis, *Comparative Economic Studies*, 56, 592-615.

Canziani, Patrizia and Petrongolo, Barbara. (2001). "Firing costs and stigma: A theoretical analysis and evidence from microdata" *European Economic Review*, 45(10): 1877-1906.

De Fraja, G., KLemos, S. and Rockey, J. (2017) The wounds that do not heal. The life-time scar of youth unemployment, Discussion Paper 11852 Centre for Economic Policy Research, LSE, London.

Demidova, O., Marelli, E. and Signorelli, M. (2015) Youth labour market performances in the Russian and Italian regions, *Economic Systems*, 39, pp43-54.

Green, A. E. and Livanos, I. (2013) Involuntary Non-Standard Employment and the Economic Crisis: Regional Insights from the UK, *Regional Studies*, 49(7), pp1-13.

Gregg, P. (2001) The impact of youth unemployment on adult unemployment in the NCDS, *Economic Journal*, 111, 626-653.

Gregg, P. and Tominey, E. (2005) The wage scar from male youth unemployment, *Labour Economics*, 12, pp487-509.

Iacovou, Maria (2001). "Leaving home in the European Union", Working Paper ISER 2001-18.

Jimeno, J.F., and Rodriguez-Palenzuela, D. (2002) Youth unemployment in the OECD: Demographic shifts, labour market institutions, and macroeconomic shocks, ECB Working Paper.

Kahn, L.M. (2007) The impact of employment protection mandates on demographic temporary employment patterns: International microeconomic evidence, *Economic Journal*, 117(521): 333-356.

Kawaguchi, D. and Murao, T. (2012) Who bears the cost of the business cycle? Labour market institutions and the volatility of the youth unemployment rate, *IZA Journal of Labor Policy*, 1, pp1-22.

Kelly, E. and McGuinness, S. (2015) Impact of the Great Recession on unemployed and NEET individuals' labour market transitions in Ireland, *Economic Systems*, 39, pp59-71.

Korenman, S. and Neumark, D. (2000) Cohort crowding and youth labour markets: A cross-national analysis, pp. 57-105 in Blanchflower, D. and Freeman, R. (Eds) *Youth, Employment and Joblessness in Advanced Countries*, Chicago, University of Chicago Press, 2000.

Lopez-Bazo, E., del Barrio, T. and Artis, M. (2002) The regional distribution of Spanish unemployment: A spatial analysis, *Papers in Regional Science*, 81, 365-389.

Maguire, S. (2015) NEET, unemployed, inactive or unknown – why does it matter?, *Education Research*, 57, 2, pp121-132.

Marston, (1985) Two views of the geographical distribution of unemployment, *Quarterly Journal of Economics*, 100, 57-79.

Martin, R. (1997) Regional Unemployment Disparities and their Dynamics, *Regional Studies*, 31:3, 237-252.

Modesto, Leonor. (2008). "Unions, Firing Costs, and Unemployment" LABOUR, 22(3): 509-546.

Molho, J. (1995) Spatial autocorrelation in British unemployment, *Journal of Regional Science*, 35, 641-658.

Moller, J. (2017) Youth unemployment in Europe from a regional perspective', CESifo Forum 2, 18, June.

OECD (2009) *Jobs for Youths: Australia*, OECD Publishing, Paris.

Perugini, C. and Signorelli, M. (2010) Youth labour market performance in European regions, *Economic Change Restructuring*, 43, pp151-185.

Quintini, G. and Manfredi, T. (2009) Going separate ways? School-to-work transitions in the United States and Europe, OECD Social, Employment and Migration Working Paper, No. 90, OECD Publishing, Paris.

Scarpetta, S., Sonnet, A. and Manfredi, T. (2010) Rising youth unemployment during the crisis: How to prevent negative long-term consequences on a generation, OECD Social, Employment and Migration Working Papers, No. 106, OECD Publishing, Paris.

Shimer, R. (2001) The impact of young workers on the aggregate labour market, *The Quarterly Journal of Economics*, 116, pp. 969-1007.

Taylor, J. and Bradley, S. (1996) Unemployment in Europe: Analysis of regional disparities in Germany, Italy and the UK, *Kyklos*, 50, pp221-245.

Zeilstra, A. S. and Elhorst, J. P. (2014) Integrated analysis of regional and national unemployment differentials in the European Union, Regional Studies, 48, pp1739-1755.
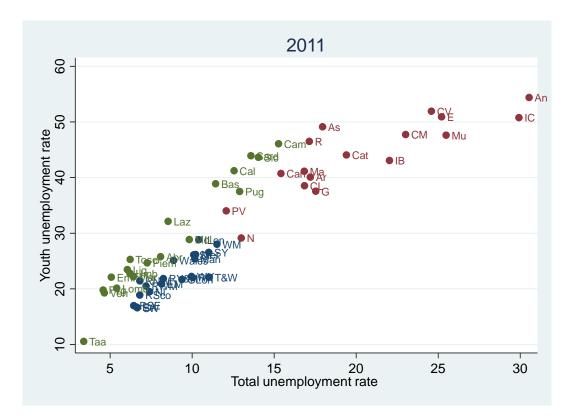
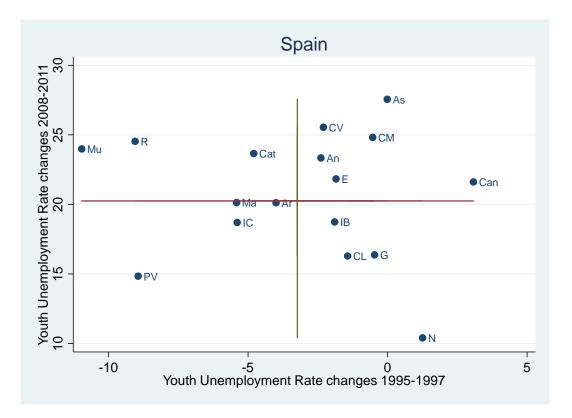Figure 1 The correlation between adult and youth unemployment rates by region, 2011

Figure 2 The relationship between changes in youth unemployment rates, 1995-97 versus 2008-11, Spain
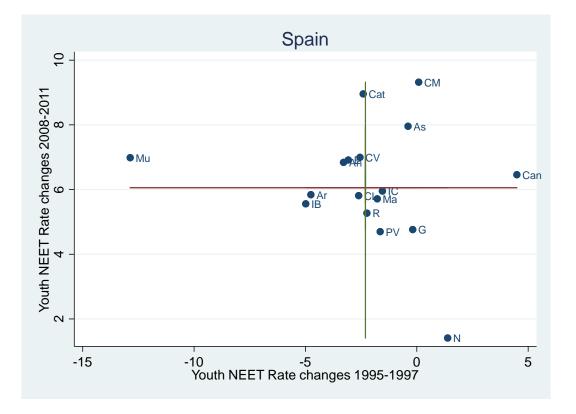

Figure 3 The relationship between changes in youth NEET rates, 1995-97 versus 2008-11, Spain
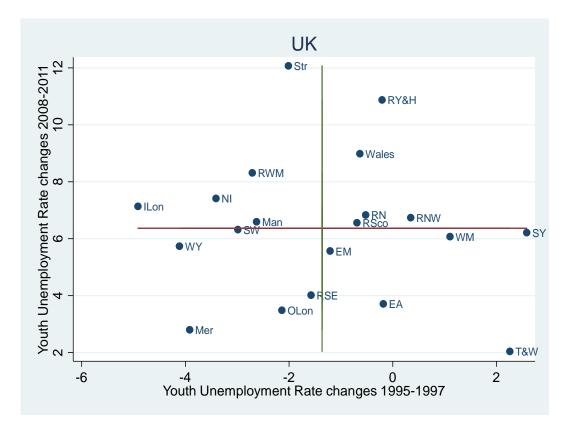
Figure 4. The relationship between changes in youth unemployment rates, 1995-97 versus 2008-11, UK
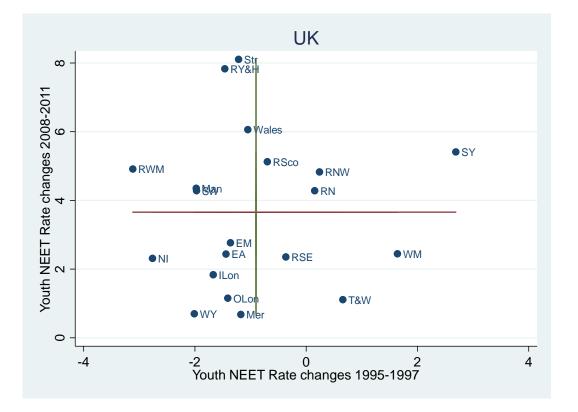

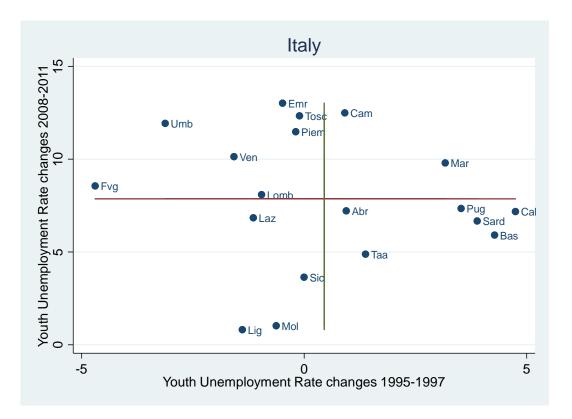Figure 5 The relationship between changes in youth NEET rates, 1995-97 versus 2008-11, UK

27

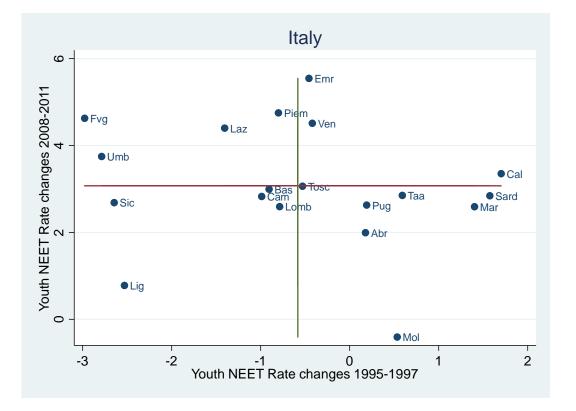Figure 6 The relationship between changes in youth unemployment rates, 1995-97 versus 2008-11, Italy

Figure 7 The relationship between changes in youth NEET rates, 1995-97 versus 2008-11, Italy

Table 1 Descriptive statistics for the five worse and five best performing regions by country

Panel A:	Italy							
Ranking	Region	UR 16-25	NEET rate 16-24	% youths with HEQ	% young	marriedfemale25	manufconstr	No SME
1	Trentino-Alto Adige	10.56	6.72	3.32	8.06	26.01	17.73	-
2	Veneto	19.28	9.88	3.59	6.52	28.58	13.54	-
3	Friuli-Venezia Giulia	19.79	10.14	3.37	5.36	28.20	14.06	-
4	Lombardia	20.14	9.94	4.64	5.99	27.89	12.47	-
5	Emilia Romagna	22.11	10.50	3.61	5.43	26.45	12.30	-
	Mean	*28.86*	*14.47*	*3.20*	*6.47*	*28.02*	*13.09*	-
	Median	*25.29*	*10.95*	*3.37*	*6.31*	*28.20*	*12.57*	-
6	Basilicata	38.89	18.64	2.31	6.71	29.48	12.20	-
7	Calabria	41.23	23.78	2.90	6.89	29.22	10.86	-
8	Sicilia	43.65	25.94	1.64	8.21	28.97	10.03	-
9	Sardegna	43.93	21.81	1.66	7.01	26.48	13.69	-
10	Campania	46.08	25.04	2.38	7.37	28.38	10.11	-

Panel B:	Spain						
Ranking	Region	UR16-24	NEET rate16-24	% youths with HEQ	% young	marriedfemale25	manufconstr	No. SME
1	Navarra	29.14	10.72	19.23	7.28	28.81	25.27	18138
2	Pais Vasco	34.02	12.97	22.85	6.01	28.32	25.29	75964
3	Galicia	37.55	14.96	14.40	6.70	27.60	26.05	92179
4	Castilla Leon	38.54	16.98	14.15	7.35	28.41	25.09	57210
5	Aragon	40.09	15.87	15.45	7.33	29.82	23.94	41547
	Mean	*43.96*	*19.03*	*13.76*	*7.94*	*28.16*	*26.18*	*83948*
	Median	*44.07*	*22.43*	*11.80*	*8.62*	*27.80*	*28.05*	*253901*
6	Asturias	49.13	18.05	16.92	5.63	29.68	25.99	32021
7	Islas Canarias	50.78	23.23	7.95	8.63	22.83	30.50	58724
8	Extremadura	50.92	21.23	13.23	9.70	29.40	21.12	27843
9	Comunidad Valenciana	51.93	22.62	11.55	8.43	28.28	26.69	157753
10	Andalucia	54.40	24.75	11.08	9.95	28.24	23.03	223965
Panel C:	UK						
Ranking	Region	UR 16-24	NEET Rate16-24	% youths with HEQ	% young	marriedfemale25	manufconstr	No. SME
1	South West	16.61	15.25	9.85	15.89	24.50	24.75	109344
2	East Anglia	16.73	15.89	8.23	15.20	24.49	24.34	115671
3	Rest of South East	16.99	15.04	10.13	14.28	25.93	23.72	174324
4	Rest of Scotland	18.89	17.04	8.93	15.33	23.82	24.13	82060.1
5	Rest of West Midlands	20.51	16.64	7.85	13.58	25.30	23.21	95306.6
	Mean	*22.54*	*18.44*	*11.05*	*15.57*	*22.56*	*22.83*	*99649*
	Median	*22.04*	*18.65*	*8.88*	*15.63*	*23.50*	*23.05*	*33698*
6	Strathclyde	26.12	21.29	10.63	16.18	22.24	23.69	82060.1
7	Merseyside	26.17	20.04	9.02	15.69	19.32	21.00	116799
8	South Yorkshire	26.55	23.43	11.33	18.80	21.16	23.52	86013.9

| 9 | West Midlands | 28.02 | 20.73 | 11.32 | 16.57 | 21.80 | 19.29 | 95306.6 |
| 10 | Inner London | 28.83 | 18.80 | 23.15 | 10.88 | 15.50 | 19.45 | 166824 |

Note: The UR rate and the NEET rates are annual rates for 2011.

Table 2 The determinants of quarterly variations in regional unemployment rates (16-19 year olds), 1993-2011

VARIABLES	UK		Spain		Italy	
	Without	with Region FE	without	with Region FE	Without	with Region FE
URnational adult	0.745***	0.681***	2.253***	2.350***	-0.497	0.064
	(0.258)	(0.218)	(0.145)	(0.124)	(0.343)	(0.293)
% youths with HEQ workforce	0.377***	0.052	-0.359	0.051	-0.385***	-0.364***
	(0.114)	(0.064)	(0.276)	(0.156)	(0.123)	(0.116)
% young	1.064***	0.275*	-0.760	1.030	-0.424	0.544**
	(0.317)	(0.145)	(0.658)	(0.643)	(0.383)	(0.225)
% Marriedfemale25	-0.368***	-0.075**	-0.416	0.379*	-1.303***	-1.682***
	(0.087)	(0.036)	(0.352)	(0.217)	(0.321)	(0.213)
% Immigr	0.291	0.814***	0.172	0.551***		
	(0.185)	(0.219)	(0.121)	(0.104)		
% Manufconstr	-0.177***	-0.164***	-0.135	-0.178	-0.828***	-0.265**
	(0.031)	(0.018)	(0.157)	(0.134)	(0.212)	(0.107)
Log (SME)	-4.286***	-0.089	-3.634	11.513*		
	(0.781)	(0.483)	(2.109)	(5.911)		
% Temp	0.069	-0.488*	0.242	-0.509***	0.388***	-0.020
	(0.331)	(0.264)	(0.211)	(0.115)	(0.110)	(0.112)
% PartTime	0.071	0.318	0.995	0.886**	-0.399*	-0.005
	(0.308)	(0.210)	(0.598)	(0.346)	(0.217)	(0.137)
Firstq	-0.232	-0.713**	0.311	-0.133	-1.443***	-1.647***
	(0.299)	(0.313)	(0.826)	(0.625)	(0.448)	(0.449)
Secondq	0.268	-0.600	0.451	0.849	-2.177***	-2.183***
	(0.328)	(0.390)	(0.796)	(0.649)	(0.434)	(0.433)
Thirdq	1.708***	2.279***	-0.791	-1.012**	-1.047***	-0.934**
	(0.401)	(0.296)	(0.549)	(0.434)	(0.316)	(0.338)
Regional real GDP lagged	0.035	-0.005	0.104**	-0.125*	0.009	0.137***
	(0.030)	(0.028)	(0.042)	(0.063)	(0.007)	(0.046)
Constant	56.726***	13.141	58.039**	-124.810	72.593***	57.517***
	(18.336)	(11.157)	(21.635)	(74.200)	(13.187)	(7.673)
Observations	1,512	1,512	1,368	1,368	1,406	1,406
R-squared	0.634	0.757	0.605	0.745	0.220	0.376

Table 3 The determinants of quarterly regional unemployment rates (16-24 year olds), 1993-2011

VARIABLES	UK		Spain		Italy	
	without	with Region FE	without	with Region FE	without	with Region FE
URnational adult	1.109***	1.160***	1.736***	1.790***	1.471*	2.906***
	(0.210)	(0.116)	(0.134)	(0.129)	(0.776)	(0.508)
% youths with HEQ workforce	0.072	-0.090*	-0.396**	-0.103	-0.704*	0.251
	(0.084)	(0.051)	(0.187)	(0.132)	(0.354)	(0.237)
% young	0.817***	0.165*	-0.754	1.178*	-1.333*	0.400
	(0.219)	(0.089)	(0.608)	(0.661)	(0.724)	(0.522)
% Marriedfemale25	-0.231***	-0.026	-0.572*	0.257	-3.863***	-1.417*
	(0.063)	(0.027)	(0.324)	(0.169)	(1.151)	(0.693)
% Immigr	0.103	0.379***	-0.028	0.433***		
	(0.149)	(0.115)	(0.107)	(0.083)		
% Manufconstr	-0.103***	-0.083***	-0.442***	-0.127	-2.256***	-0.708***
	(0.023)	(0.010)	(0.150)	(0.123)	(0.364)	(0.174)
Log (SME)	-3.372***	-0.930**	-1.860	-2.276		
	(0.611)	(0.332)	(1.697)	(7.807)		
% Temp	0.179	-0.093	0.251	-0.505***	2.289***	-0.296
	(0.239)	(0.141)	(0.211)	(0.109)	(0.323)	(0.199)
% PartTime	0.054	0.467***	0.490	0.418	-2.535***	-0.128
	(0.181)	(0.141)	(0.540)	(0.330)	(0.547)	(0.295)
Firstq	0.003	-0.278	0.350	-0.115	0.364	-1.479***
	(0.263)	(0.254)	(0.455)	(0.318)	(0.564)	(0.351)
Secondq	0.277	-0.279	-0.119	0.027	-1.663**	-1.693***
	(0.192)	(0.221)	(0.454)	(0.263)	(0.625)	(0.424)
Thirdq	0.990***	1.476***	0.157	-0.337	-2.835***	-1.416***
	(0.194)	(0.156)	(0.277)	(0.284)	(0.796)	(0.408)
Regional real GDP lagged	0.031	-0.001	0.059	-0.064	-0.006	0.148
	(0.023)	(0.017)	(0.037)	(0.042)	(0.018)	(0.139)
Constant	39.797***	8.505	54.241***	25.398	171.559***	50.524*
	(11.405)	(6.677)	(16.632)	(91.345)	(43.565)	(26.269)
Observations	1,512	1,512	1,368	1,368	1,406	1,406
R-squared	0.584	0.758	0.716	0.877	0.656	0.901

Table 4 The determinants of spatial variations in regional NEET rates (16-19 year olds), 1993-2011

VARIABLES	UK		Spain		Italy	
	without	with Region FE	without	with Region FE	without	with Region FE
URnational adult	0.098	-0.046	0.302***	0.329***	-0.079	0.304***
	(0.186)	(0.112)	(0.055)	(0.086)	(0.212)	(0.093)
% youths with HEQ workforce	-0.023	-0.098**	-0.247***	-0.124***	-0.222***	-0.034
	(0.051)	(0.044)	(0.042)	(0.043)	(0.076)	(0.055)
% young	1.354***	0.784***	0.878***	1.062***	0.265	0.636***
	(0.245)	(0.149)	(0.121)	(0.105)	(0.231)	(0.130)
% Marriedfemale25	-0.169***	-0.010	-0.197**	-0.222**	-0.936**	-0.442**
	(0.046)	(0.029)	(0.070)	(0.094)	(0.331)	(0.159)
% Immigr	0.100	0.232**	0.074*	0.160***		
	(0.092)	(0.096)	(0.037)	(0.031)		
% Manufconstr	-0.088***	-0.092***	-0.112**	-0.100	-0.601***	-0.200***
	(0.022)	(0.014)	(0.040)	(0.060)	(0.112)	(0.040)
Log (SME)	-1.199*	-0.427	-1.462***	2.304		
	(0.671)	(0.378)	(0.315)	(1.978)		
% Temp	0.533**	-0.056	-0.066	-0.200***	0.590***	-0.017
	(0.231)	(0.132)	(0.055)	(0.061)	(0.088)	(0.071)
% PartTime	0.269	0.296**	0.523***	0.402***	-0.518***	-0.008
	(0.272)	(0.141)	(0.125)	(0.111)	(0.143)	(0.061)
firstq	-0.112	-0.417**	-0.542*	-0.516*	-0.327*	-0.761***
	(0.193)	(0.167)	(0.303)	(0.284)	(0.173)	(0.171)
secondq	-0.215	-0.668**	-0.513**	-0.335*	-1.031***	-1.021***
	(0.271)	(0.285)	(0.223)	(0.190)	(0.179)	(0.169)
thirdq	2.311***	2.766***	3.634***	3.647***	0.042	0.370**
	(0.328)	(0.259)	(0.415)	(0.422)	(0.191)	(0.142)
Regional real GDP lagged	0.028	-0.015	0.041***	-0.040**	0.006	0.047
	(0.019)	(0.013)	(0.012)	(0.015)	(0.004)	(0.037)
Constant	2.561	6.307	19.226***	-17.661	39.357***	13.274**
	(17.817)	(8.288)	(4.914)	(22.104)	(12.775)	(6.103)
Observations	1,512	1,512	1,368	1,368	1,406	1,406
R-squared	0.442	0.604	0.585	0.624	0.674	0.847

Table 5 The determinants of spatial variations in NEET rates (16-24 year olds), 1993-2011

VARIABLES	UK		Spain		Italy	
	without	with Region FE	without	with Region FE	without	with Region FE
URnational adult	0.716***	0.698***	0.674***	0.710***	0.306	1.005***
	(0.171)	(0.094)	(0.067)	(0.066)	(0.369)	(0.145)
% youths with HEQ workforce	-0.025	-0.101**	-0.269***	-0.095*	-0.394**	0.055
	(0.060)	(0.043)	(0.079)	(0.046)	(0.170)	(0.098)
% young	0.970***	0.495***	0.235	0.923***	-0.166	0.473*
	(0.187)	(0.098)	(0.197)	(0.132)	(0.353)	(0.228)
% Marriedfemale25	-0.147***	-0.003	-0.340**	-0.080	-1.538**	-0.451
	(0.041)	(0.027)	(0.136)	(0.085)	(0.607)	(0.279)
% Immigr	0.094	0.199***	0.021	0.229***		
	(0.097)	(0.061)	(0.057)	(0.028)		
% Manufconstr	-0.063***	-0.056***	-0.174**	-0.054	-1.175***	-0.444***
	(0.018)	(0.009)	(0.072)	(0.052)	(0.181)	(0.062)
Log (SME)	-1.939***	-0.916***	-2.182**	-0.516		
	(0.559)	(0.259)	(0.777)	(1.484)		
% Temp	0.302	-0.044	0.079	-0.266***	1.197***	-0.145
	(0.182)	(0.094)	(0.083)	(0.057)	(0.166)	(0.092)
% PartTime	0.157	0.360***	0.395*	0.247***	-1.108***	0.018
	(0.177)	(0.094)	(0.193)	(0.073)	(0.275)	(0.121)
firstq	-0.056	-0.285	-0.228	-0.338	0.050	-0.903***
	(0.178)	(0.166)	(0.268)	(0.198)	(0.262)	(0.163)
secondq	0.166	-0.221	-0.698***	-0.517***	-0.951***	-0.915***
	(0.174)	(0.198)	(0.236)	(0.137)	(0.276)	(0.183)
thirdq	1.775***	2.142***	2.713***	2.588***	-0.677*	0.122
	(0.199)	(0.141)	(0.319)	(0.332)	(0.353)	(0.144)
Regional real GDP lagged	0.026	-0.000	0.060***	-0.032	0.000	0.055
	(0.017)	(0.016)	(0.018)	(0.019)	(0.008)	(0.068)
Constant	15.063	6.006	35.930***	10.601	71.275***	20.323*
	(11.651)	(5.074)	(9.918)	(16.496)	(23.231)	(11.513)
Observations	1,512	1,512	1,368	1,368	1,406	1,406
R-squared	0.532	0.697	0.705	0.809	0.709	0.929

Table 6 Spatial clustering and youth unemployment rates (16-19 year olds), AR IV models

	UK			Spain			Italy		
	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage
ln Wyoung		17.825***			8.025***		b/se	1.403***	
		-2,744			(0.884)			(0.197)	
ln young	5.735**	1,949	4,450	4,680	-3,334	4,808	0.025	-0.028	0.006
	-2,457	-2,445	-3,362	-4,292	-3,876	-3,839	(0.049)	(0.029)	(0.060)
Wur 1619	0.251***		0.344*	0.319***		0.558***	0.051		-0.608**
	(0.041)		(0.193)	(0.033)		(0.109)	(0.053)		(0.279)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1444	1444	1444	1368	1368	1368	1425	1425	1425
LM stat		41,880			79,400			28,133	

Table 7 Spatial clustering and youth unemployment rates (16-24 year olds), AR IV models

	UK			Spain			Italy		
	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage
ln Wyoung		13.531***			6.922***			4.046***	
		-1,936			(0.657)			(0.538)	
ln young	4.229***	1,607	3.886*	7.342***	1,326	7.480***	0.002	-0.189***	-0.104
	-1,398	-1,725	-2,018	-2,773	-2,881	-2,402	(0.077)	(0.055)	(0.088)
Wur 1624	0.428***		0.461***	0.263***		0.226***	0.173***		-0.381***
	(0.036)		(0.152)	(0.027)		(0.079)	(0.027)		(0.112)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes
Observations	1444	1444	1444	1368	1368	1368	1425	1425	1425
LM stat		48,268			104,784			29,660	

Table 8 Spatial clustering and NEET rates (16-19 year olds), AR IV models

	UK			Spain			Italy		
	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage
ln Wyoung		11.524***			0.963**			2.298***	
		-1,901			(0.389)			(0.237)	
ln young	6.423***	5.404***	3,256	0.351	0.108	-0.017	-0.037*	-0.061***	-0.054**
	-1,848	-1,694	-3,192	-1,818	-1,707	-2,273	(0.022)	(0.019)	(0.022)
Wneet 1619	0.202***		0.444**	0.150***		0.980*	0.035		-0.241***
	(0.040)		(0.216)	(0.039)		(0.537)	(0.027)		(0.057)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region FE		Yes	yes		yes	yes		yes	yes
Observations	1444	1444	1444	1368	1368	1368	1425	1425	1425
LM stat		36,601			6,226			36,522	

Table 9 Spatial clustering and NEET rates (16-24 year olds), AR IV models

	UK			Spain			Italy		
		1st stage	2nd stage		1st stage	2nd stage		1st stage	2nd stage
ln Wyoung		12.464***			2.507***			2.987***	
		-1,574			(0.374)			(0.343)	
ln young	5.499***	2,112	5.728***	-0.501	-1,646	-0.413	-0.067**	-0.135***	-0.114***
	-1,248	-1,403	-1,783	-1,519	-1,641	-1,436	(0.027)	(0.027)	(0.028)
Wneet 1624	0.341***		0.318**	0.206***		0.320**	0.140***		-0.201***
	(0.035)		(0.140)	(0.030)		(0.131)	(0.022)		(0.055)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1444	1444	1444	1368	1368	1368	1425	1425	1425
LM stat		61,351			44,416			33,891	

Appendix A: Definition of Variables

Table A1. Descriptive statistics. Mean and Standard Deviation (in parentheses)

	UK	SPAIN	ITALY
UR 16-24	15.862	30.484	27.591
	(4.806)	(12.462)	(15.686)
UR 16-19	21.812	40.683	17.008
	(8.325)	(15.321)	(6.186)
NEETS RATE 16-24	14.543	15.648	15.027
	(3.652)	(6.941)	(8.123)
NEETS RATE 16-19	16.334	11.731	8.476
	(4.567)	(6.763)	(4.672)
URnational adult	5.140	13.551	6.381
	(1.616)	(4.571)	(0.982)
% youths with HEQ workforce	10.219	18.607	2.081
	(4.993)	(7.595)	(1.680)
% young	16.185	12.625	9.642
	(1.494)	(3.343)	(2.881)
% Marriedfemale25	25.788	27.440	29.781
	(3.891)	(2.651)	(1.410)
% Immigr	8.563	5.177	
	(8.927)	(7.182)	
% Manufconstr	54.945	21.163	10.503
	(14.419)	(6.776)	(3.617)
Log (SME)	11.388	10.666	15.616
	(0.541)	(1.095)	(0.936)
% Temp	6.640	31.169	11.456
	(1.294)	(6.904)	(4.380)
% PartTime	27.078	9.110	9.920
	(2.740)	(2.965)	(3.829)
Regional real GDP lagged vabctesl	82.279	37.666	64.472
	(46.607)	(38.536)	(58.970)
Observations	1,512	1,368	1,406

Table A2 Definition of variables

	Definition
UR 16-24 (65 years old onwards are excluded)	Unemployed out of the unemployed, employed and on government training 16-24
UR 16-19	Unemployed out of the unemployed, employed and on government training 16-19
NEETS RATE 16-24	Inactive and unemployed out of the inactive, unemployed, employed, government training and in education 16-24
NEETS RATE 16-19	Inactive and unemployed out of the inactive, unemployed, employed, government training and in education 16-24
URnational adult	Unemployed out of the unemployed, employed and on government training for those 25 years old and older
% youths with HEQ workforce	Proportion of youth with higher education qualifications in the workforce
% young	Proportion of youth 16-24 out of the whole population
% Marriedfemale25	Proportion of married females under 25 years old
% Immigr	Proportion of immigrants out of the whole population
% Manufconstr	Proportion of workers in manufacture and construction industries
Log (SME)	The log of the number of small and medium enterprises (<50 workers)
% Temp	Rate of temporary employment out of all contracts (temporary and full time contracts)
% PartTime	Rate of part time employment out of full time and part time contracts
Regional real GDP lagged	Gross Value Added in million of Euros

Note: All variables are disaggregated at a regional and quarterly level and drawn from the country specific labour force surveys, except for the number of small and medium enterprises and the regional real GDP,

disaggregated at a regional and annual level. These were obtained from BIS (ONS) and DIRCE (INE) and the corresponding national institutes of statistics (ONS, INE and ISTAT), respectively.

Table A3 Description of acronyms

	UK		Spain		Italy
T&W	Tyne & Wear	An	Andalucia	Piem	Piemonte
RN	Rest of Northern Region	Ar	Aragon	Vda	Valle d'Aosta
SY	South Yorkshire	As	Asturias	Lomb	Lombardia
WY	West Yorkshire	IB	Islas Baleares	Taa	Trentino-Alto Adige
RY&H	Rest of Yorks & Humberside	IC	Islas Canarias	Ven	Veneto
EM	East Midlands	Can	Cantabria	Fvg	Friuli-Venezia Giulia
EA	East Anglia	CL	Castilla Leon	Lig	Liguria
Ilon	Inner London	CM	Castilla La Mancha	Emr	Emilia Romagna
Olon	Outer London	Cat	Cataluna	Tosc	Toscana
RSE	Rest of South East	CV	Comunidad Valenciana	Umb	Umbria
SW	South West	E	Extremadura	Mar	Marche
WM	West Midlands	G	Galicia	Laz	Lazio
RWM	Rest of West Midlands	Ma	Madrid	Abr	Abruzzo
Man	Greater Manchester	Mu	Murcia	Mol	Molise
Mer	Merseyside	N	Navarra	Cam	Campania
RNW	Rest of North West	PV	Pais Vasco	Pug	Puglia
Wales	Wales	R	La Rioja	Bas	Basilicata
Str	Strathclyde	CeMe	Ceuta y Melilla	Cal	Calabria
Rsco	Rest of Scotland			Sic	Sicilia
NI	Northern Ireland			Sard	Sardegna