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THE UNEMPLOYMENT-SPECIALIZATION RELATIONSHIP UNDER COLLECTIVE BARGAINING CONSTRAINTS EVIDENCE FROM EU REGIONS[#]

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ABSTRACT

Standard labor market theories predict that workers employed in more specialized areas earn higher wages in comparison with similar workers employed in less specialized areas. Empirical studies for the US generally confirm the existence of a positive effect of sectoral specialization on wages and on unemployment. However, these relationships might not hold in labor markets that are characterized by substantially higher collective bargaining coverage and more centralized bargaining systems. In the EU, for example, collective wage agreements impose identical wages across regions belonging to the same country, thus leaving little room for regional wage flexibility.

Using regional data for EU member states, we model regional unemployment as a function of regional specialization measures. The comparison between such countries – still characterized by separate and independent collective agreements on wages – will give us new insights on the effects that collective bargaining may have on the relationship between sectoral specialization of regions and regional unemployment rates.

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1. INTRODUCTION

The increasing globalization that is leading to ever-growing economic relationships between countries has recently stimulated a large amount of literature concerned with the different aspects of the location of economic activities.

The majority of theoretical and empirical analyses in this field investigate the determinants of location of economic activities across countries or across regions belonging to the same country. This literature can be divided in three strands. The neo-classical trade theory explains patterns of sectoral specialization on the basis of differences in productivity (technology) or endowments across countries and regions. The new trade theory and, more recently, the new economic geography, underline increasing returns in production, agglomeration economies and cumulative processes as explanations for the concentration of activities in particular countries and regions. For recent surveys we refer to Amiti (1998); Venables (1998); Brülhart (1998); Aiginger et al. (1999); Hallet (2001) and Puga (2002). According to these theories, the observable patterns of sectoral specialization are mainly a consequence of trade liberalization, economic integration and reduction in transportation costs.

From a different perspective, another part of the literature concerned with location of economic activities, considers such location decisions as exogenous and focuses instead on the effects of specialization on regional growth and on labor market variables like wages and unemployment. The empirical evidence, which is mainly based on US data, generally confirms the existence of a positive effect of sectoral specialization on wages and unemployment (see, e.g., Simon, 1988; Diamond and Simon, 1990; Wheaton and Lewis, 2002 and Izraeli and Murphy, 2003). However, these empirical findings might not be able to describe labor markets – like the European ones – characterized by significantly lower wage flexibility and by a more important role of unions in the wage bargaining process.

In the EU, wages are usually bargained between few workers' and few firms' representatives at sectoral or national levels. Such agreements, that usually concern a high percentage of workers employed in the same economic sector, are often referred to as collective wage agreements. The outcomes of collective agreements are generally (minimum) standards on wages and working conditions that are binding nationwide, but can be improved by more firm-specific agreements. As a result,

though nominal wages are set identical across regions of the same country, a certain upward nominal wage flexibility is allowed.

Since firms located in less specialized regions are less productive than similar firms located in more specialized regions, and are therefore willing to pay lower wages to their workers (Combes and Duranton, 2001), the wage bargained at national level might be considered as a constraint for such firms. This constraint is expected to be less binding for more productive firms located in more specialized regions. Being unable to fix wages to the optimal level, in the short run these firms will react by changing their desired level of employment, ultimately influencing regional unemployment. This might eventually result in relationships between unemployment and sectoral specialization that are different from the ones previously observed for the US.

In this paper we develop further on this point and analyze the relationship between regional sectoral specialization and regional unemployment rate in EU countries with different – and still separate¹ – collective bargaining systems. In this framework, the comparison between countries with different collective bargaining rules will give us new insights on the effects that collective bargaining may have on regional unemployment disparities. Our aim is therefore to test whether – and how – the relationship between location of activity and unemployment in EU countries is affected by collective bargaining rules and by collective bargaining institutions.

The existing literature on the effects of collective bargaining institutions on labor market variables finds that countries with high unionization levels, in which wages are bargained collectively and there is no coordination between either unions or employers, are characterized by comparatively higher levels of unemployment (Nickell, 1997). Furthermore, these countries also show comparatively lower wage differentials among workers (Kuhn, 1998). Our analysis differs from such literature because we focus on unemployment disparities across regions belonging to the same country rather than focusing on international comparisons. We find that regional specialization has a positive correlation with the regional unemployment rate in those countries characterized by situations of either very weak or very strong collective bargaining agreements.

¹ Despite their increasing economic integration, European countries are still characterized by separate and independent collective wage agreements, with little or no international coordination across trade unions (Borghijs et al., 2003).

The paper is therefore organized as follows. In Sections 2 and 3 we briefly summarize the previous empirical evidence on the relationship between specialization and labor market variables, and give a very short overview of collective bargaining systems in Europe. Some considerations on the effects of collective bargaining institutions on the unemployment-specialization relationship are given in Section 4. Section 5 illustrates the dataset and estimates the empirical model. Section 6 concludes.

2. EVIDENCE ON THE EFFECTS OF SPECIALIZATION ON LABOR MARKET VARIABLES

Empirical evidence for the US generally shows that location of economic activity, measured by sectoral specialization, has a relevant effect on many labor market variables.

Firms located in more specialized regions can gain from agglomeration effects like, for example, knowledge spillovers and labor pooling and can, therefore, be generally more productive than similar firms located in less specialized regions. Wheaton and Lewis (2002) test the hypothesis that workers employed in more specialized regions are more productive and therefore earn higher wages than workers employed in less specialized regions, and find a positive relationship between individual wages and regional specialization. Their results are coherent both with the previous analysis made by Diamond and Simon (1990) using data on individuals located in 43 US cities, and with the recent study by Izraeli and Murphy (2003) on aggregated data for US states. The positive wage-specialization relationship seems therefore robust to different levels of aggregations.

On the basis of the portfolio theory introduced by Markowitz (1952), a region in which employment is diversified in a high number of economic sectors should be characterized by lower unemployment probability than a region which is specialized in a small number of sectors. While in specialized regions a demand shock affecting one industry may affect the economy of the whole region, in diversified regions other industrial sectors might compensate for the negative shocks affecting one sector (Puga and Duranton, 1999). The existence of a positive relationship between unemployment and specialization is confirmed by a number of empirical analyses for US cities (Simon, 1988; Diamond and Simon, 1990; Simon and Nardinelli, 1992), states (Malizia and Ke, 1993; Izraeli and Murphy, 2003) and broad US regions (Neumann

and Topel, 1991). The results for EU regions at NUTS 1 level of Munro and Schachter (1999) also support US findings of a positive unemployment-specialization relationship.

After a brief introduction on relevant characteristics of collective bargaining systems, in the following sections we will investigate the effect that collective bargaining might have on the unemployment-specialization relationship.

3. COLLECTIVE BARGAINING SYSTEMS: A BRIEF OVERVIEW

Wage bargaining over wages and working conditions can take place at several different levels. At one extreme, negotiations take place between firms and employees at the level of the individual enterprise or establishment (the so-called decentralized systems). At the other extreme, in the so-called “centralized systems”, negotiations take place at country level between national unions and employers’ associations, sometimes with the government as a third partner (OECD, 1997). In between these two extreme situations, collective bargaining can take place at sectoral, branch or industry-level.

According to the indicator on the degree of centralization which is computed by the OECD, while Canada and US may be considered as highly decentralized systems, Nordic European countries such as Finland, Sweden and Norway are characterized by highly centralized systems. Among the European countries, UK is nowadays the most decentralized one, while countries such as Belgium, the Netherlands and Germany have an intermediate level of centralization.

In practice, wage setting establishing national or branch-level agreements on (minimum) standards can still be modified at more decentralized levels (Wallerstein et al., 1997). Such conditions prevent downward wage flexibility and, at the same time, leave room for upward wage flexibility.

Another important characteristic of collective bargaining systems is the degree of consensus reached by the bargaining partners (degree of coordination). The differences between the degree of centralization and the degree of coordination are only minor: in highly centralized systems the degree of coordination and centralization are likely to coincide, and only more decentralized systems may show degrees of coordination that are higher than what the formal level of centralization would suggest. In Europe, the coordination indicator, which is also computed by the

OECD, exhibits more variation than the centralization one (Borghijs et al., 2003). Among European countries, UK is the one with the lowest degree of coordination, while Germany and Austria score as the most coordinated ones. According to OECD (1997), the indicator is slightly increasing in France and considerably increasing in Italy, while it is decreasing in Denmark and Sweden.

The above-mentioned characteristics of collective wage bargaining are likely to have a strong influence on the general level of wages, only in those countries where the number of workers covered by the collective agreements is high. In many EU countries the outcomes of collective bargaining are extended also to non-union members. As a result, the percentage of workers to which collective agreements are extended (collective bargaining coverage) might be more important than the percentage of workers that are union members (trade union density) in identifying the influence that collective agreements and collective bargaining institutions have on the national economy. Also from this point of view there is a substantial difference between the US and the EU. While in the US only about one third of workers is covered by collective agreements, in European countries these figures range from a minimum of about 70% of Denmark to values higher than 90% in Austria, Belgium, Germany, France Finland and Sweden. The only exception among European countries is the UK, with values lower than 50%. According to EEAG (2004) data, collective bargaining coverage is also low in most EU accession countries. In countries such as Estonia, Lithuania, and Latvia, collective bargaining coverage is lower than 30%. Remarkable exceptions are Cyprus and Slovenia, where collective bargaining coverage reaches 70% and 100% respectively.

In our empirical analysis we will use these indicators to analyze how the unemployment-specialization relationship differs between countries with dissimilar collective bargaining institutions. In the next section we will introduce some theoretical considerations on the effect that such different collective bargaining institutions might have on the relationship between regional unemployment and regional sectoral specialization.

4. THEORETICAL CONSIDERATIONS

The empirical analyses on the relationship between unemployment and specialization discussed in the previous sections implicitly assume that wages are endogenously

determined on the basis of industrial and regional characteristics such as, for example, labor productivity. Because of collective bargaining, this assumption is likely not to hold across regions belonging to European countries.

In EU countries, collective bargaining institutions set lower floors to nominal wages that have to be applied nationwide, independently on regional differences in prices and labor productivity. In this situation no regional disparities in nominal wages are allowed. As a result of such exogenously determined wages, each firm will decide on the number of workers to hire, ultimately influencing the regional unemployment rate (Faini, 1999).

There are at least a couple of reasons for which we might expect firms located in more specialized regions to (be willing to) pay higher wages than firms located in less specialized regions. The first, as suggested by Combes and Duranton (2001) and by Wheaton and Lewis (2002), is the higher productivity of firms and labor located in more specialized regions. The second reason is related to the lower monopsony power of firms located in more specialized regions. In regions characterized by a high level of specialization we expect to find a high number of similar firms employing similar workers. Since workers might be able to find similar jobs in other firms without having to migrate or accept longer commuting times, in more specialized regions firms might not be able to fix wages that are lower than what is offered by their competitors. In regions characterized by low specialization, instead, because of the lower probability of workers to find similar jobs without having to migrate, firms might have more monopsony power.² In such regions we might therefore observe lower wages than in more specialized regions.

Firms located in less specialized regions might therefore consider the agreed wages³ too high and might reduce employment accordingly.⁴ In contrast, because of their higher productivity, firms located in more specialized regions might be willing to pay wages that are higher than the ones agreed at national level. Since wage flexibility

² A first test on such monopsony hypothesis was carried out with respect to the wage curve relationship in West German regions, by Longhi et al. (2004).

³ We assume here that the wages agreed at national or sectoral level are a (weighted) average of wages that each firm would ideally be willing to pay to their workers.

⁴ Depending on layoff regulation, we might not have significant direct effects on unemployment. We will have, however, an indirect effect when firms will reduce the desired level of employment by deciding not to open new vacancies, by closing the open ones or by increasing the time needed to fill them. Furthermore, according to OECD (1999), the employment protection is becoming weaker in countries such as Spain, Italy and Finland, is remaining stable in Greece and Austria, and is becoming stronger only in France.

is only allowed upward (Calmfors, 1993), we expect comparatively higher unemployment rates in regions with a lower level of sectoral specialization. This might therefore reduce regional unemployment disparities induced by regional specialization. However, we also expect this ‘equalization’ effect to be weaker in those countries where the importance of bargaining institutions is high.

Calmfors and Driffill (1988) argue that both very centralized and very decentralized bargaining systems lead to wage moderation, while the highest real wages may be associated with intermediate levels of centralization. While in centralized systems lower wages are explained by the internalization of various wage externalities such as higher prices or higher unemployment, in decentralized systems lower wages are explained by the restraints imposed by market forces. At intermediate levels of centralization, instead, both market forces and internalization effects could be too weak to restrain wages. Wage moderation might also be a consequence of a high degree of coordination reached when separate bargaining groups coordinate their actions at higher – national or sectoral – level.

For our analysis we might then assume that more centralized wage bargaining institutions have long-run objectives, like, for example, preventing layoffs or trying to reach lower unemployment levels. Institutions with an intermediate level of centralization might instead only have short-run objectives, represented by higher nominal wages for their members.

Since collective bargaining systems usually fix a lower bound to wages, only allowing upward wage adjustments, we might expect substantially higher wage flexibility in those countries where collective bargaining is centralized or coordinated. As a result, no significant relationship between specialization and unemployment should be found in those countries where bargaining is not centralized/coordinated⁵. The positive unemployment-specialization relationship might instead still be valid in those countries where collective bargaining is centralized. More in details, we expect the unemployment-specialization relationship to react to collective bargaining institutions following a U-shaped curve. This relationship should be stronger when collective bargaining is either centralized or decentralized, while it should be weaker in between these two extremes. This hypothesis will be tested in the next section.

⁵ This is the intermediate situation: these countries are not classified as decentralized, nor as centralized. We therefore call them “not centralized”. Furthermore, from this moment on, we consider

5. EMPIRICAL EVIDENCE

DATA AND MEASUREMENT

For our empirical analysis we use regional data at NUTS 1 level on regional sectoral⁶ employment, and regional unemployment for EU countries. While for EU countries data is generally available from 1979 to 2001, for EU accession countries is available at most from 1995 to 2001.

The source of data on regional unemployment is the REGIO database of Eurostat. With some exceptions (Germany, The Netherlands and UK), also data for sectoral regional employment is collected from the REGIO database. German data was provided by the Hessisches Statistisches Landesamt. Dutch and UK data have been collected respectively from the Centraal Bureau voor de Statistiek (CBS) and from the Nomis websites⁷. The employment data provided by Eurostat has a series break in 1995. Before 1995, the dataset subdivides the manufacturing activities in 10 sub-sectors, while services are subdivided in 5 sub-sectors. From 1995, no decomposition of the manufacturing sector is available.

Following previous studies, we use sectoral employment data to discriminate between more and less specialized regions by computing the Herfindhal index (H_{crt}). Such index is computed as the sum over sectors of the squared share of employment in region r and sector i at time t (E_{crt}) over total employment of region r at time t , in the following way:

$$H_{crt} = \sum_i \left(\frac{E_{crt}}{\sum_i E_{crt}} \right)^2 \quad (1)$$

The index H_{crt} ranges from $1/N$ – where N is the number of sectors – in case of perfect diversification, to one in case of complete regional sectoral specialization (when all employees of the region work in the same economic sector). Therefore, a region is more diversified the more even is the distribution of employees across sectors (Simon, 1988).

the degree of centralization and the degree of coordination as one single indicator, which we refer to as ‘degree of centralization’.

⁶ We focus our analysis on the manufacturing and on the services sector, excluding agriculture and the public sector, which are supposed to be less mobile than the other two sectors.

⁷ More in details, UK data has been collected from <http://www.nomisweb.co.uk/>, while Dutch data has been collected from <http://statline.cbs.nl/StatWeb/start.asp?LA=en&DM=SLLEN&lp=Search/Search>.

To discriminate between labor markets with different institutional bargaining systems we use the OECD (1997) indicators of bargaining coverage and of the degree of centralization. The indicator about the degree of centralization has values between 1 – in case of decentralized or non-coordinated bargaining – and 3 – in case of centralized or coordinated bargaining. For more details about these indicators and their evolution over the 1980s and the 1990s we refer to OECD (1997) and to Borghijs et al. (2003). These data enter our empirical analysis by means of two dummies. The first dummy (Low Centralization dummy) identifies those countries with a comparatively low degree of centralization and has value 1 when both the centralization and the coordination indices are less than, or equal to, 1.5. The second dummy (High Centralization dummy) identifies those countries with a comparatively high degree of centralization and has value 1 when either the centralization or the coordination indices are higher than, or equal to, 2.5.

The degree of centralization and coordination are more likely to be relevant when the number of workers and firms for which the collective agreements have to be applied is high. These information are summarized by two OECD (1997) indicators: the union density; and the collective bargaining coverage. While the union density is defined as the percentage of employees with union membership, the collective bargaining coverage is defined as the percentage of employees covered by collective agreements. The union density enters our empirical analysis by means of two dummies. The first dummy – Low Union Density dummy – identifies those countries with a union density lower than 25%, while the second dummy – High Union Density dummy – identifies those countries where union density is higher than 75%. Similarly, we compute two dummies for the collective bargaining coverage. The first dummy – Low Coverage dummy – identifies those countries with a collective bargaining coverage lower than 25%, while the second dummy – High Coverage dummy – identifies those countries where collective bargaining coverage is higher than 75%.

Since information about the degree of centralization, the degree of coordination, the union density, and the collective bargaining coverage are available for different points in time, the dummies might have value 1 in certain time periods and zero in others.

OECD (1997) data on union density is available for every year from 1979 to 1997. We collected more recent figures – for 2001 – from EEAG (2004). Data on bargaining

coverage is only available for 1980, 1990 and 1994 from OECD (1997) and for 2001 from EEAG (2004). Finally, data on the degree of centralization and on the degree of coordination is available for 1980, 1990 and for 1994. For those years for which the data is missing, we assume a linear trend between the two consecutive observations.

The estimated models and the empirical results will be illustrated in the next sections, after a brief description of the national differences of the data at hand.

UNEMPLOYMENT RATE AND SECTORAL SPECIALIZATION LEVEL

Our dataset is characterized by relevant regional disparities in unemployment rates and sectoral specialization levels.

The regional unemployment rate ranges from a minimum of 0.8 of the Finnish region of Åland in 1988 and in 1990, to a maximum of 32.8 of the Sur region of Spain in 1994. Generally, Finland and Sweden have the lowest, while Italy and Spain have the highest levels of unemployment rate.

As previously mentioned, while the first part of our data on sectoral employment splits manufacturing activities in a certain number of sub-sectors, the second part of the dataset considers manufacturing as one single group. Because of this break in the series, the Herfindhal index computed on the first part of the dataset might not be directly comparable with the one computed on the second part of the dataset.

The Herfindhal index computed on the first part of the dataset ranges from a minimum of 0.101 in the regions of East France in 1975, to a maximum of 0.228 in the Finnish region of Åland in 1993. The Herfindhal index computed on the second part of the dataset ranges from a minimum of 0.104 in the Comunidad de Madrid (Spain) in 1995 to a maximum of 0.241 in West Midlands (UK) in 1996.

According to the OECD (1997) data, union density less than 10% in Spain at the beginning of the 80s, and in France in the late 90s. At the other extreme, union density is very high in Finland, where it is usually more than 75%, and in Sweden, where it is usually higher than 80%.

Collective bargaining coverage in the countries under analysis ranges from 36% of UK in the late 90s, to 95% of Finland and 98% of Austria. The bargaining coverage is sharply increasing in France and, more slowly, in Spain and Italy, while it is stable in Finland and Austria. The degree of coordination is close to two in Spain, France and Finland, while it is closer to three in Italy and Austria.

In the next sub-section we will present the empirical model analyzing regional unemployment rates as a function of sectoral specialization, collective bargaining coverage and degree of coordination.

THE MODEL AND THE EMPIRICAL RESULTS

On the basis of the data introduced in the previous sections, we now analyze the effect of collective bargaining institutions on the unemployment-specialization relationship. We regress the natural logarithm of the Herfindhal index of region r – belonging to country c – at time t ($h_{crt} = \ln(H_{crt})$) on the natural log regional unemployment rate (ur_{crt}) after controlling for some regional characteristics in the following way:

$$ur_{crt} = \alpha_r + \alpha_t + \beta_1 h_{crt} + \beta_2 (h_{crt} * \mathbf{CBD}) + \varepsilon_{rt} \quad (2)$$

Where the vector **CBD** identifies the set of collective bargaining dummies⁸ introduced in the previous sections. The regional dummies (α_r) correct for the effect of region-specific omitted variables that do not change over time, while the time dummies (α_t) correct for omitted region-invariant time-specific shocks.⁹ Finally, β_1 and β_2 , are the parameters to be estimated, while ε_{rt} is the remaining error term.

While the coefficient β_1 estimates the overall effect of sectoral specialization on unemployment, the coefficient β_2 estimates the additional effect that we expect to find in countries with particular collective bargaining characteristics, represented by the dummies in the **CBD** vector.

Table 1 shows the results of the models estimated on the basis of equation (2).¹⁰ All estimations include a full set of time and regional dummies. Since the specialization index can only be computed for those countries that are subdivided in more than one region, we drop from our dataset all countries that – at the considered disaggregation level – are composed of only one region. We also exclude from our analysis the French, Spanish and Portuguese overseas departments.

⁸ Low Centralization, High Centralization, Low Union Density, High Union Density, Low Coverage and High Coverage dummy. The choice of using dummies is motivated by the problem of endogeneity of the institutional bargaining indicators pointed out by Blanchard and Wolfers (2000).

⁹ On this point we differ from previous empirical studies. Simon and Nardinelli (1992) and Munro and Schachter (1999) use cross section data; Simon (1988) and Diamond and Simon (1990) only use time dummies, while Malizia and Ke (1993) only add broad states dummies. Izraeli and Murphy (2003) use fixed and random effects estimators without time dummies.

¹⁰ As a sensitivity analysis we also estimated the model in (2) using a semi-log specification, obtaining results that are very similar to the ones presented in Table 1. The fit of the semi-log specification is slightly worse than the fit of the double-logs specification.

Because of the already mentioned break in our series, the Herfindhal indices computed on the two parts of the dataset, corresponding to the two classifications of economic activities, might not be directly comparable. Regions that are highly specialized according to the first classification of economic activities, might not have a high specialization level when we use the second classification. As a result, the break in the series might not be consistent with time-invariant regional fixed effects. In order to allow the regional fixed effect to be affected by such break, we compute the “within transformation” separately for the two parts of the dataset and, as suggested in Baltagi (2001) and in Hsiao (2003), compute OLS on the transformed data. This approach should allow for regional-specific time-invariant intercepts that might differ between the two parts of the dataset. On the other hand, though we have no specific reasons to expect the series break to have an effect on the slope of the unemployment-specialization relationship, we include one more interaction term among the explanatory variables of (2). This variable is equal to zero for all observations belonging to the first part of the dataset, and is equal to the Herfindhal index for all observations belonging to the second part of the dataset. A more thorough analysis of the effect induced by a change in the sectoral classification of employment is beyond the scope of our analysis and is therefore left for more specific researches.

In the first column of Table 1, the simplest model is estimated. Here the only explanatory variables are Herfindhal index computed for the whole dataset; the Herfindhal index computed only for the second part of the data set; and the population density. As expected, and consistently with the previous studies, the coefficient of the Herfindhal index is positive and significant. The coefficient of the Herfindhal index computed only on the second part of the dataset (when manufacturing is not decomposed in sub-sectors) has instead a negative but insignificant coefficient. This result is consistent with our belief that the unemployment-specialization relationship should not be affected by the specific classification of economic activities. Because this second specialization index seems not to have any effect on our estimations, we will not discuss its coefficient any longer. In what follows, when we discuss the Herfindhal/specialization index we will only refer to the index computed on the whole dataset.

The model in the second column of Table 1 analyzes the effect of collective bargaining characteristics on the unemployment-specialization relationship by means

of the interaction variables illustrated in the previous sections. In this model the specialization index is still positive, but highly insignificant. The coefficients of the interaction between the Herfindhal index and both union density dummies, as well as the interaction with the bargaining coverage dummy, are positive and significant. These results are consistent with the hypothesis of a U-shaped unemployment-specialization relationship. While in those countries with either very weak or very strong collective bargaining systems the regional specialization level seems to have an increasing impact on the regional unemployment rate. In the intermediate situation, which is measured by the reference category, the specialization level seems to have no influence on the unemployment rate.

More in details, our results suggest that the effect of union density and collective bargaining coverage in shaping the unemployment-specialization relationship is – *ceteris paribus* – higher than the level at which bargaining takes place. Since in European countries, with the only exception of UK, the degree of centralization is always relatively high, this indicator might show a low variability. We might therefore expect the percentage of workers affected by the collective agreements to play a bigger role than the degree of centralization in our analysis. From an economic point of view, we might expect the degree of centralization to play a role in the analysis only when the number of workers affected by collective bargaining decisions is relatively high. As a result, the effect of the indicator about the degree of centralization might be conditional to the value of the union density and bargaining coverage indicators.

In the subsequent estimations shown in Table 1 we add the ***CBD*** dummies among the regressors of equation (2). Like in the first two columns of Table 1, the estimation is computed by means of OLS run on the within transformation. Since they might change their value – from zero to one or vice versa – over time, the ***CBD*** dummies are not constant and can therefore be estimated also in the framework of the fixed effect model. Such further explanatory variables might be interpreted as average levels of the log unemployment rate that are common to all countries with similar collective bargaining characteristics. As a result, the within transformation (regional fixed effects) only capture the remaining specific regional effects, neat of the partial means captured by the ***CBD*** terms.

In the third column of Table 3 we add the ***CBD*** dummies and assume that their coefficients are the same across the two parts of the dataset. In the fourth column of

Table 3 we allow the coefficients of the *CBD* dummies to differ across the two parts of the dataset, as we did for the Herfindhal index and the regional fixed effect. The results of the model shown in column (4) of Table 3 are consistent with our previous findings. The slope of the specialization index seems to be positive significant only in those countries with high and in those countries with low union density. The coefficients of the level effects – the *CBD* dummies – seem to be generally consistent with what found in the previous literature in slightly different contexts (see, for example, Nickell, 1997). In the first part of the dataset, when the manufacturing sector is subdivided in a certain number of sub-sectors, higher union density seems to increase unemployment. However, a low centralization level seems to be correlated with comparatively lower values of the log unemployment rate. In the second part of the dataset, when the manufacturing sector is not subdivided in sub-sectors, both the High Union Density dummy, and the High Centralization dummy have negative and significant values. Though we cannot rule out the possibility that a different classification of economic activities might reveal a different behavior of the service sector compared to the manufacturing sector, this last result should be interpreted with caution. The short length of the series and the low variability of the *CBD* dummies do not allow a deeper analysis of the differences between the two classifications of economic activities. This research direction is therefore left for future researches.

6. CONCLUSIONS

In this paper we analyzed the relationship between regional unemployment and regional sectoral specialization in EU countries. Consistently with previous studies, we find that higher (lower) regional unemployment rate is correlated with higher (lower) regional sectoral specialization.

We also analyze the effect of collective bargaining institutions on the unemployment-specialization relationship, finding a strong positive correlation in those countries with either very high or very low union density. The degree of coordination/centralization seems to have no effect on the unemployment-specialization relationship. A possible explanation for this result is that the degree of centralization is likely to play a relevant role only in those countries where the number of workers affected by collective bargaining decisions is relatively high.

Our results are generally consistent with the hypothesis of the existence of a U-shaped relationship between the effect of sectoral specialization on unemployment and the level of bargaining coordination. This might have interesting policy implications. In those countries characterized by situations of either very weak or very strong collective bargaining agreements the positive unemployment-specialization relationship suggests the possibility of reducing regional unemployment differentials by favoring regional diversification of economic activities. In countries characterized by the intermediate situation, instead, given the insignificant unemployment-specialization relationship, such policies favoring regional diversification might be unable to reduce regional unemployment disparities.

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Table 1: Effects of collective bargaining on the relationship between sectoral specialization and unemployment. (Data is at NUTS 1 level)

Dep. Variable: <i>ln</i> Unemployment Rate	(1)	(2)	(3)	(4)
<i>ln</i> Herfindhal Index	0.675** (0.290)	0.448 (0.411)	0.733 (0.442)	0.677 (0.430)
<i>ln</i> Herfindhal Index (#)	0.096 (0.778)	0.212 (0.714)	0.776 (0.613)	0.188 (0.507)
<i>ln</i> Herfindhal Index * Low Centralization dummy		-0.710 (0.943)	-0.380 (0.924)	0.244 (0.816)
<i>ln</i> Herfindhal Index * High Centralization dummy		0.018 (0.016)	-0.162*** (0.050)	0.169 (0.178)
<i>ln</i> Herfindhal Index * Low Union Density dummy		0.219*** (0.036)	0.214*** (0.060)	0.209*** (0.060)
<i>ln</i> Herfindhal Index * High Union Density dummy		0.262*** (0.081)	0.258** (0.110)	2.007*** (0.527)
<i>ln</i> Herfindhal Index * Low Coverage dummy				
<i>ln</i> Herfindhal Index * High Coverage dummy		0.114*** (0.019)	0.005 (0.053)	0.012 (0.053)
Low Centralization dummy			-0.475*** (0.036)	-0.480*** (0.037)
High Centralization dummy			-0.305*** (0.078)	0.315 (0.326)
Low Union Density dummy			0.032 (0.075)	0.027 (0.076)
High Union Density dummy			-0.036 (0.065)	2.874*** (0.733)
Low Coverage dummy				
High Coverage dummy			-0.106 (0.089)	-0.092 (0.091)
Low Centralization dummy (#)				
High Centralization dummy (#)				-0.682* (0.349)
Low Union Density dummy (#)				
High Union Density dummy (#)				-2.943*** (0.709)
Low Coverage dummy (#)				
High Coverage dummy (#)				
Observations	721	721	721	721
Adjusted R-squared	0.250	0.312	0.527	0.531

Huber-White robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. (#): the variable is different than zero only on the 2nd part of the dataset. All estimations include a full set of time and regional dummies. The 'missing' coefficients correspond to variables that were dropped because of no variation over time.