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THE EVOLUTION OF THE EMPLOYMENT IN THE EUROPEAN UNION. A STOCHASTIC SHIFT AND SHARE APPROACH

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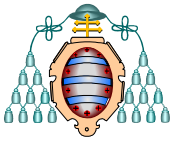

Abstract

The employment is a main economic variable whose evolution has shown different dynamics within the European Union. Recent papers have recovered the significance of the sectoral factors in the explanation of the regional growth. In this sense, shift and share analysis has been considered an extremely useful technique and a standardization procedure has been developed to decompose the regional growth into three components: the national effect, the industry-mix effect and the competitive effect. Although shift and share analysis has been widely used in the explanation of the differences of growth between regions, this method has been criticized since its classical formulation does not allow to test hypotheses.

Therefore, stochastic models have been developed as an extension of classical shift and share analysis, allowing the implementation of inferential processes and forecasting tools. The aim of this paper is to analyze the recent evolution of the employment in the European Union, developing a stochastic shift and share model and testing the sources of regional and sectoral differences.

The evolution of the employment in the European Union.

A stochastic shift and share approach

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1. Introduction

The development of a co-ordinated strategy for employment has been specified as an objective in the Title VIII of the Treaty establishing the European Community. Since then, many efforts have been made in order to formulate suitable strategies, establishing guidelines and recommendations to the Member States.

The European Employment Strategy political agenda was defined at the Lisbon Summit (spring 2000) under the strategic goal "to make out of the European Union the world´s most competitive knowledge-based economy, capable of ensuring sustainable development, full employment and greater social cohesion" and confirmed by the European Councils up to Barcelona (2002).

The existence of different regional and sectoral behaviours in the evolution of the labor markets within the EU has been shown in several recent works. These investigations range a wide variety of statistical techniques providing useful evidence about the determinants of the unemployment and the effects and efficiency of national and regional policies.

In this work we study the spatial-sectoral dynamics within the European Union during the period 1990-2000 by means of the shift and share analysis in its classic and stochastic formulations.

The paper is structured as follows. Section 2 contains a brief description of the shift-share traditional formulation, introducing the *european effect*, the *structural effect* (related to the sectoral component) and the *competitive effect* (related to the spatial dynamics).

In section 3 we present the stochastic formulation of the shift-share model, allowing for an inferential analysis of its components. An extension is considered is section 4 through ANOVA analysis with two factors.

Some empirical application of the proposed models are presented in section 5, using the statistical information provided by Eurostat Regio databases.

The paper ends with some concluding remarks and a list of bibliographical references.

2. The shift and share traditional model

The shift and share analysis has achieved from its origin a great success within regional science, due to its wide variety of possibilities. This technique was first developed by E.S. Dunn (1960) as a method for the determination of the components explaining the variations in economic magnitudes.

As K. Berzeg (1978) states, from a theoretical point of view the shift-share analysis is a synthesis of two ideas. The first of them ties with the theory of the economic growth, reflecting the relationship between the level of economic development and the sectoral composition. More specifically, less developed economies are characterized by a high weight of the primary sector while the industry is usually assumed to impulse economic growth and the most developed economies are characterized by a high specialisation in services.

The second fact gathered in the shift-share analysis is based on the existing structural differences between the economies of the different investigated spatial scopes. Since the necessity exists to explain a change, it can be attributed to differences in the initial resources availability, but nevertheless this justification is incomplete since it does not include the advantages or disadvantages related to location and transport costs.

In its traditional formulation, the shift-share analysis allows to express the change experienced by an economic magnitude in a certain period of time as the sum of three components. The first of them (usually designed *national effect)* is related to the global evolution of the investigated scope, while the *sectoral effect* (also named

structural or *industry-mix effect)* describes the differences in growth between economic sectors and the *competitive or spatial effect* picks up the differential specialisation based on the location.

Since this work is referred to the employment in the European Union (EU) let us denote by $r_{ij} = \frac{E_{ij}^{t'} - E_{ij}^{t}}{E_{ij}^{t}}$ the rate of variation of the employment in sector i (i=1, ..., S) of region j (j=1, ..., R), being $r_i = \frac{\sum_j E_{ij}^{t'} - \sum_j E_{ij}^{t}}{\sum_j E_{ij}^{t}}$ the sectoral rate of variation for i and $r = \frac{\sum_{i,j} E_{ij}^{t'} - \sum_{i,j} E_{ij}^{t}}{\sum_{i,j} E_{ij}^{t}}$ the global rate of variation within the EU employment.

Then, the shift and share identity can be expressed as follows:

$$r_{ij} = r + (r_i - r) + (r_{ij} - r_i) \qquad (1)$$

where (always in relative terms) r is the *european effect*, (r_i-r) is the differential *sectoral or structural effect* and $(r_{ij}-r_i)$ is the *differential spatial effect.*

As we have previously described the european effect can be interpreted as a standard of growth for the employment of the European Union as a whole, while the *sectoral or structural effect* considers the differential contribution introduced by each economic activity and the *competitive or spatial effect* gathers the special dynamism displayed by a sector in a specific area in comparison with the dynamism of that same sector at the european level.

Although shift-share analysis is widely used in regional studies this technique has been criticized due to different reasons, including its theoretical content, some aggregation issues (from a temporal, spatial and sectoral point of view) and predictive limitations.

The absence of theoretical content is, according to Fotopoulos and Spence (1999), the fundamental critic to the shift and share analysis. In fact, this limitation had already been pointed out by Stilwel (1969) and has originated a controversy throughout the last decades. Thus, according to Richardson (1978) the shift-share analysis does not conclude anything about the capacity of a region to retain or attract

mighty sectors, while Fothergill and Gudgin (1979) argue that a correct identification of the competitive effect together with another variables allow the investigator to test hypotheses about the determinants of the differences in regional growth.

The incapacity attributed to the classic analysis to separate the compared sectorial effect of the competitive effect leads to some extensions based on the idea of "homothetic employment". This concept firstly introduced by Esteban (1972) was extendend by Arcelus (1984) to all the components of the shift-share and analysis.

The aggregation problems refer to the changes in the shift-share results depending on the considered agregation levels. In fact, different studies show how the competitive effect tends to zero as the aggregation level increases (although the same problem is common to other regional techniques).

Some authors have also detected asymmetry problems in shift-share analysis, since the final results are affected by the considered weights (referred to an initial, final or intermediate year). On the other hand, Barff and Knight (1988) propose the yearly computation of the effect on the basis of a "dynamic" shift-share analysis.

Finally, some authors like Kurre and Weller (1989) show the shift-share limitations as a predictive tool, closely connected with the instability of the competitive effect.

3. The Shift-share stochastic model

In spite of the critics referred to the shift and share analysis, few attention has been paid to the statistical variants of this technique, including the stochastic version proposed by Berzeg (1978, 1984) based on the analysis of the variance, and also the contributions of Theil and Gosh (1980) and Haynes and Machunda (1988) based on the information theory.

Berzeg (1978) provides a statistical basis for shift-share analysis in terms of Analysis of Variance (ANOVA). More especifically, he shows that identity (1) can be formalised as follows:

$$r_{ij} = \beta_0 + \beta_i D_i + e_{ij} \qquad (2)$$

where β_0 gathers the rate of global (european) growth, β_i is the growth of sector i in region j due to the compared sectorial effect or industry-mix $(r_i - r)$, D_i is a dummy variable related to this sector and e_{ij} is a term of random error equivalent to the difference between the rate of growth of sector i in region j and the rate of regional growth of this sector $e_{ij} = (r_{ij} - r_i)$, with i=1, ..., S and j=1, ..., R.

This linear model is mathematically equivalent to the traditional shift-share identity (1) and leads to identical results under weighted least squares (WLS) estimation, assuming that the random terms are heteroskedastic with:

$$E\left(e_{ij}^2\right) = \frac{\sigma^2}{w_{ij}^*} = \sigma^2 \frac{\sum_{i,j} E_{ij}}{E_{ij}} \tag{3}$$

where E_{ij} represents the initial employment of sector i in region j.

The ANOVA-based shift-share analysis is preferable to the traditional method since it allows to test quantitative hypotheses about the variations of the employment. More specifically, under the normality hypothesis for e_{ij}, the ratio of the parameter estimators to their standard errors will be distributed as Student´s t.

The general model can be expressed as:

$$R = X\beta + e \tag{4}$$

where R is the vector of rates of variation for each sector and region, X is a matrix integrated by a unitary column (associate to the regional effect) and dummy sectoral variables and β is the vector of coefficients associated to the regional and sectoral effects.

Since the columns related to the explanatory variables are linearly dependent, matrix X is not of total rank and some restrictions must be introduced, removing one of the dummy variables, As a result of this transformation the parameter related to one sector cannot be estimated while the remaining parameters are determined only up to a constant. Thus, the intercept in equation (2) equals the sum of the european effect of identity (1) and the proportional shift component related to the variable which cannot be estimated in (2).

Fotopoulos and Spence (1999) criticize the use of one factor ANOVA analysis and the emphasis on the supposed numerical equivalence of this method with the traditional shift-share analysis. According to these authors, the attractiveness of the transformation proposed by Berzeg is more apparent than real since it gives greater value to the numerical equivalence than to the heterokedasticity correction.

In fact, the introduction of fixed regional effects will not only alter the corresponding estimations of the coefficients of industry-mix, but also its variances destroying the numerical equivalence.

4. Shift-share analysis with two factors

The consideration as both the sectoral effects and the regional effects is possible by means of the analysis of the variance with fixed effects.

According to this new approach, a region can have a rate of growth (r_j) different from the european rate due to differences in its sectorial composition and/or its sectoral growth rates. This formulation can be raised from the initial shift-share model expressing the rate of growth of a region j as:

$$r_j - r = \sum_i \left(w_{ij} - w_i\right) r_i + \sum_i w_{ij}\left(r_{ij} - r_i\right) \tag{5}$$

where w_{ij} are the weights of the sectoral employment of sector i of region j over the regional employment.

$$w_{ij} = \frac{E_{ij}}{\sum_i E_{ij}} \tag{6}$$

According to expression (5) the difference between the rate of growth of a particular region and the european rate can be distributed in two effects: on the one hand, the structural effect that gathers the difference between the european rate of growth and what it had happened if the regional industry had grown to the european rate and, on the other hand, the differential effect where we compared the regional rate of growth with the hypothetical rate assuming the european evolution for the own region.

The ANOVA formulation for the shift-share model can be expressed as follows:

$$r_{ij} = \beta_i D_i + \gamma_j D_j + e_{ij} \qquad (7)$$

where β_i and γ_j respectivelly denote the parameters related to the dummy sectoral variables and the dummy regional variables and e_{ij} is the random disturbance for which the normality hypothesis is assumed.

The computation of expected values leads to the following expressions:

$$E(r_j) = \sum_i w_{ij}\beta_i + \gamma_j \qquad E(r) = \sum_i w_i \beta_i + \sum_j w_j \gamma_j \qquad (8)$$

Thus, the sectoral and competitive effects can be estimated as follows:

$$ESC = \sum_i (w_{ij} - w_i)\hat{\beta}_i \qquad EC = \hat{\gamma}_j - \sum_j w_j \hat{\gamma}_j \qquad (9)$$

and the aggregation of both effects approaches the expected diferential between the growth of employment in region j and the european growth.

It must be noticed that the presence of an interaction effect leads to the non-additivity of the industry mix and the competitive effects. Therefore, the Tukey test should be performed testing the interaction (or non-additivity) hypotesis.

5. An empirical application to the European Union

The previously considered shift-share models allow the study of the sectoral and regional effects in the evolution of the european employment.

With this aim we have considered the information about employment collected by Eurostat in the Regio database for the period 1980-1996.

From the sectoral point of view three different sectors are considered (agriculture, industry and services), while the spatial division includes three complementary classifications, following the Nomenclature of Territorial Units for Statistics (NUTS) resumed in table 1.

EU Member state	NUTS1	NUTS2		
BELGIQUE-BELGIE	REG.BRUXELLES-CAP./BRUSSELS HFDST.GEW. VLAAMS GEWEST REGION WALLONNE	REG.BRUXELLES-CAP./BRUSSELS HFDST.GEW. ANTWERPEN LIMBURG (B)	OOST-VLAANDEREN VLAAMS BRABANT WEST-VLAANDEREN BRABANT WALLON	HAINAUT LIEGE LUXEMBOURG (B) NAMUR
DANMARK	DANMARK	DANMARK		
DEUTSCHLAND	BADEN-WUERTTEMBERG BAYERN BERLIN BRANDENBURG BREMEN HAMBURG ESSEN MECKLENBURG-VORPOMMERN NIEDERSACHSEN NORDRHEIN-WESTFALEN RHEINLAND-PFALZ SAARLAND SACHSEN SACHSEN-ANHALT SCHLESWIG-HOLSTEIN THUERINGEN	STUTTGART KARLSRUHE FREIBURG TUEBINGEN OBERBAYERN NIEDERBAYERN OBERPFALZ OBERFRANKEN MITTELFRANKEN UNTERFRANKEN SCHWABEN BERLIN BRANDENBURG BREMEN HAMBURG DARMSTADT	GIESSEN KASSEL MECKLENBURG-VORPOMMERN BRAUNSCHWEIG HANNOVER LUENEBURG WESER-EMS DUESSELDORF KOELN MUENSTER DETMOLD ARNSBERG KOBLENZ TRIER RHEINHESSEN-PFALZ SAARLAND	CHEMNITZ DRESDEN LEIPZIG DESSAU HALLE MAGDEBURG SCHLESWIG-HOLSTEIN THUERINGEN
ELLADA	VOREIA ELLADA KENTRIKI ELLADA ATTIKI NISIA AIGAIOU, KRITI	ANATOLIKI MAKEDONIA, THRAKI KENTRIKI MAKEDONIA DYTIKI MAKEDONIA THESSALIA IPEIROS	IONIA NISIA DYTIKI ELLADA STEREA ELLADA PELOPONNISOS	ATTIKI VOREIO AIGAIO NOTIO AIGAIO KRITI
ESPAÑA	NOROESTE NORESTE MADRID CENTRO (E) ESTE SUR CANARIAS	GALICIA ASTURIAS CANTABRIA PAIS VASCO NAVARRA RIOJA ARAGON	MADRID CASTILLA-LEON CASTILLA-LA MANCHA EXTREMADURA CATALUNA COMUNIDAD VALENCIANA BALEARES	ANDALUCIA MURCIA CEUTA Y MELILLA CANARIAS
FRANCE	ILE DE FRANCE BASSIN PARISIEN NORD-PAS-DE-CALAIS EST OUEST SUD-OUEST CENTRE-EST MEDITERRANEE DEPARTEMENTS D'OUTRE-MER	ILE DE FRANCE CHAMPAGNE-ARDENNE PICARDIE HAUTE-NORMANDIE CENTRE BASSE-NORMANDIE BOURGOGNE NORD-PAS-DE-CALAIS LORRAINE	ALSACE FRANCHE-COMTE PAYS DE LA LOIRE BRETAGNE POITOU-CHARENTES AQUITAINE MIDI-PYRENEES LIMOUSIN RHONE-ALPES	AUVERGNE LANGUEDOC-ROUSSILLON PROVENCE-ALPES-COTE D'AZUR CORSE GUADELOUPE MARTINIQUE GUYANE REUNION
DANMARK	DANMARK	DANMARK		
IRELAND	IRELAND	BORDER, MIDLAND AND WESTERN	SOUTHERN AND EASTERN	
LUXEMBOURG	LUXEMBOURG (GRAND-DUCHE)	LUXEMBOURG (GRAND-DUCHE)		

ITALIA	NORD OVEST LOMBARDIA NORD EST EMILIA-ROMAGNA CENTRO (I) LAZIO ABRUZZO-MOLISE CAMPANIA SUD SICILIA SARDEGNA	PIEMONTE VALLE D'AOSTA LIGURIA LOMBARDIA TRENTINO-ALTO ADIGE VENETO FRIULI-VENEZIA GIULIA EMILIA-ROMAGNA TOSCANA UMBRIA MARCHE	LAZIO ABRUZZO MOLISE CAMPANIA PUGLIA BASILICATA CALABRIA SICILIA SARDEGNA	
NEDERLAND	NOORD-NEDERLAND OOST-NEDERLAND WEST-NEDERLAND ZUID-NEDERLAND	GRONINGEN FRIESLAND DRENTHE OVERIJSSEL	GELDERLAND FLEVOLAND UTRECHT NOORD-HOLLAND	ZUID-HOLLAND ZEELAND NOORD-BRABANT LIMBURG (NL)
OESTERREICH	OSTOESTERREICH SUEDOESTERREICH WESTOESTERREICH	BURGENLAND NIEDEROESTERREICH WIEN	KAERNTEN STEIERMARK OBEROESTERREICH	SALZBURG TIROL VORARLBERG
PORTUGAL	CONTINENTE ACORES MADEIRA	NORTE CENTRO (P) LISBOA E VALE DO TEJO	ALENTEJO ALGARVE ACORES	MADEIRA
SUOMI/FINLAND	MANNER-SUOMI AALAND	ITA-SUOMI VALI-SUOMI	POHJOIS-SUOMI UUSIMAA (SUURALUE)	ETELA-SUOMI AALAND
SVERIGE	SVERIGE	STOCKHOLM OESTRA MELLANSVERIGE SYDSVERIGE NORRA MELLANSVERIGE	MELLERSTA NORRLAND OEVRE NORRLAND SMAALAND MED OEARNA VAESTSVERIGE	
UNITED KINGDOM	NORTH EAST NORTH WEST YORKSHIRE AND THE HUMBER EAST MIDLANDS WEST MIDLANDS EASTERN LONDON SOUTH EAST SOUTH WEST WALES SCOTLAND NORTHERN IRELAND	TEES VALLEY AND DURHAM NORTHUMBERLAND AND TYNE AND WEAR CUMBRIA CHESHIRE GREATER MANCHESTER LANCASHIRE MERSEYSIDE EAST RIDING AND NORTH LINCOLNSHIRE NORTH YORKSHIRE SOUTH YORKSHIRE WEST YORKSHIRE DERBYSHIRE AND NOTTINGHAMSHIRE LEICESTERSHIRE, RUTLAND AND	NORTHAMPTONSHIRE LINCOLNSHIRE HEREFORDSHIRE, WORCESTERSHIRE AND WARWICKSHIRE SHROPSHIRE AND STAFFORDSHIRE WEST MIDLANDS EAST ANGLIA BEDFORDSHIRE AND HERTFORDSHIRE ESSEX INNER LONDON OUTER LONDON BERKSHIRE, BUCKINGHAMSHIRE AND OXFORDSHIRE	SURREY, EAST AND WEST SUSSEX HAMPSHIRE AND ISLE OF WIGHT KENT GLOUCESTERSHIRE, WILTSHIRE AND NORTH SOMERSET DORSET AND SOMERSET CORNWALL AND ISLES OF SCILLY DEVON WEST WALES AND THE VALLEYS EAST WALES NORTH EASTERN SCOTLAND EASTERN SCOTLAND SOUTH WESTERN SCOTLAND HIGHLANDS AND ISLANDS NORTHERN IRELAND

Table 1: Nomenclature of Territorial Units for Statistics (NUTS)

Since the European Union changed its composition during our period of study, only those countries and regions included in the EU since 1990 were considered in our empirical analysis. Thus, the conclusions obtained in this section are referred to 12 countries and the corresponding 58 NUTS1 and 123 NUTS2.

The comparison of traditional shift-share and the industry-mix effects obtained in terms of ANOVA appear in Tables 2, 3 and 4. Since the stochastic approach has been carried out using weights w_{ij}* as defined in expression (3), both methods lead to similar conclusions, and these do not significantly change for different spatial aggregations.

	Traditional Shift Share	**Stochastic Shift Share**	
Economic Activity	**(r_i-r)**	$\hat{\beta}_i$ **(Std.Error)**	**Estimated** $(r_i - r)$
Agriculture	**-0.4036**	-0.2982 (0.078)***	**-0.4036**
Industry	**-0.1384**	-0.0330 (0.035)	**-0.1384**
Services	**0.1216**	0.2271 (0.026)***	**0.1216**

$H_0 : \beta_1 = \beta_2 = \beta_3 = 0;\ F_{33}^2 = 29.524^{***}$

Table 2: Sectoral effects obtained in classic and stochastic Shift-Share analysis by countries

	Traditional Shift Share	**Stochastic Shift Share**	
Economic Activity	**(r_i-r)**	$\hat{\beta}_i$ **(Std.Error)**	**Estimated** $(r_i - r)$
Agriculture	**-0.3837**	-0.3166 (0.030)***	**-0.3837**
Industry	**-0.1317**	-0.0645 (0.014)***	**-0.1317**
Services	**0.1211**	0.1882 (0.010)***	**0.1211**

$H_0 : \beta_1 = \beta_2 = \beta_3 = 0;\ F_{171}^2 = 126.476^{***}$

Table 3: Sectoral effects obtained in classic and stochastic Shift-Share analysis by NUTS1

	Traditional Shift Share	**Stochastic Shift Share**	
Economic Activity	**(r_i-r)**	$\hat{\beta}_i$ **(Std.Error)**	**Estimated** $(r_i - r)$
Agriculture	**-0.3819**	-0.3144 (0.019)***	**-0.3819**
Industry	**-0.1262**	-0.1262 (0.0128)***	**-0.1262**
Services	**0.1210**	0.1210 (0.0127)***	**0.1210**

$H_0 : \beta_1 = \beta_2 = \beta_3 = 0; F_{366}^2 = 229.29^{***}$

Table 4: Sectoral effects obtained in classic and stochastic Shift-Share analysis by NUTS2

[NOTE: Significat results at levels 10%, 5% and 1% are respectively indicated by *, ** and ***]

The obtained results show a decrease in the agricultural employment which could be explained by the adjustment processes imposed by the Common Agrarial Policy. Reconversion processes are also present in the industrial employment, leading to a negative effect while employment in services registers considerable rates of growth during the considered decade.

Once we have estimated the β_i terms of model (2) sectoral effects can be computed for each of the countries and/or regions. Furthermore, the regional component can be approached through the observed residuals according to Berzeg´s method.

The estimated effects are represented in Figure 1, showing that the competitive effects have greatly contributed to the employment growth in Ireland, Germany and Spain.

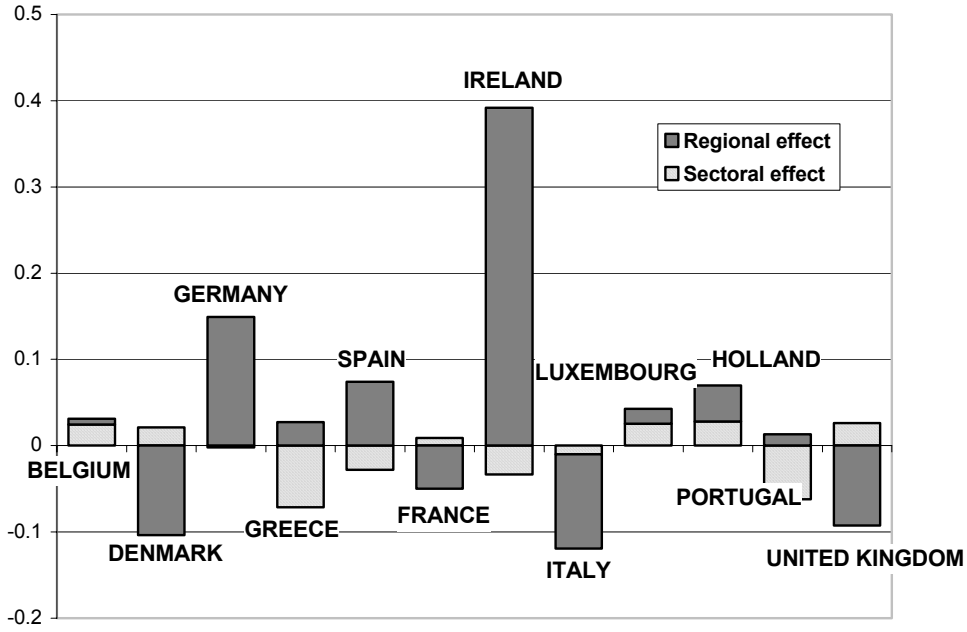

Figure 1: Estimated sectoral and regional effects

The specification of expression (7) allows the estimation of the specific regional effects. Thus, the application of two-factor ANOVA analysis to the european regions employment is advisable in order to obtain more detailed results also testing the significance of the regional effects. A compilation of the NUTS1 estimated results is presented in Table 5, showing significative effects for most of the regions.

As expected, the hypoteses of null sectoral and regional effects are clearly rejected since the result $F^{2}_{114} = 343.13^{***}$ is obtained when testing the hypothesis $H_{0A} : \beta_i = 0, \forall i$ and $F^{57}_{114} = 5.402^{***}$ when $H_{0B} : \gamma_j = 0, \forall j$ is tested.

	INDUSTRY-MIX		COMPETITIVE EFFECT	
NUTS1	ESTIMATED	TRADITIONAL	ESTIMATED	TRADITIONAL
be1	0.071(0.003)***	0.075	-0.075 (0.012)***	-0.075
be2	0.018 (0.004)***	0.018	0.102 (0.020)***	0.074
be3	0.029 (0.004) ***	0.031	0.007 (0.017)	0.015
dk	0.022 (0.0008) ***	0.024	-0.106 (0.017)***	-0.068
de1	-0.010 (0.002) ***	-0.014	-0.041 (0.022)*	-0.031
de2	-0.014(0.002***	-0.016	0.004 (0.024)	-0.017
de3	0.039 (0.002) ***	0.040	0.387 (0.017) ***	0.292
de5	0.040 (0.002) ***	0.040	-0.150(0.017) ***	-0.138
de6	0.048 (0.001) ***	0.049	-0.070 (0.017)***	-0.064
de7	0.013 (0.0008) ***	0.011	-0.032 (0.015)*	-0.060
de9	0.005 (0.001) ***	0.003	-0.011 (0.02)	-0.009
dea	0.006 (0.001) ***	0.003	-0.005 (0.02)	-0.036
deb	0.002 (0.002) ***	-0.001	0.002 (0.023)	0.011
dec	0.014 (0.001) ***	0.011	-0.027 (0.024)	-0.041
def	0.024 (0.0009) ***	0.025	-0.104 (0.070)	-0.080
gr1	-0.112 (0.013) ***	-0.107	0.080 (0.018)***	0.068
gr2	-0.159 (0.002) ***	-0.150	0.008 (0.126)	-0.019
gr3	0.037 (0.010) ***	0.037	0.110 (0.134) ***	0.089
gr4	-0.103 (0.007) ***	-0.094	0.123 (0.017)***	0.113
es1	-0.092 (0.002) ***	-0.087	-0.019 (0.031)	-0.017
es2	-0.018 (0.005) ***	-0.019	0.072 (0.024)**	0.103
es3	0.039 (0.0009) ***	0.039	0.121 (0.025)***	0.125
es4	-0.064 (0.003) ***	-0.062	0.093 (0.017)***	0.070
es5	-0.010 (0.001) ***	-0.013	0.148 (0.03)***	0.109
es6	-0.032 (0.002) ***	-0.029	0.187 (0.024)***	0.175
es7	0.020 (0.0003) ***	0.024	0.282 (0.025)***	0.304
fr1	0.052 (0.001) ***	0.054	-0.039 (0.016)**	-0.063
fr2	-0.006 (0.0003)***	-0.006	-0.016 (0.014)	-0.008
fr3	0.013 0.001) ***	0.012	0.011 (0.023)	-0.021
fr4	0.006 (0.001)	0.005	-0.048 (0.021)**	-0.001
fr5	-0.015 (0.001) ***	-0.013	-0.026 (0.022)	0.012
fr6	-0.017 (0.002) ***	-0.013	0.072 (0.023)***	0.048
fr7	0.003 (0.0005) ***	0.002	0.017 (0.022)	0.019
fr8	0.026 (0.001) ***	0.030	-0.070 (0.022)***	-0.067
ie	-0.031 (0.003) ***	-0.029	0.469 (0.016)***	0.426
it1	-0.005 (0.0003) ***	-0.006	-0.117 (0.024)***	-0.083
it2	-0.002 (0.0017) ***	-0.005	-0.058 (0.023)**	-0.032
it3	-0.011 (0.0004) ***	-0.013	-0.038 (0.024	0.017
it4	-0.021 (0.001) ***	-0.022	-0.047 (0.025)*	-0.013
it5	-0.003 (3.1e-5) ***	-0.004	-0.126 (0.026)***	-0.065
it6	0.037 (0.001) ***	0.042	-0.156 (0.023)***	-0.119
it8	-0.000 (0.001) ***	0.003	-0.234 (0.015)***	-0.180
ita	-0.013 (0.003) ***	-0.008	-0.171 (0.019)***	-0.144
lu	0.027 (0.001) ***	0.028	0.126 (0.021***	0.053
nl1	0.016 (0.0006) ***	0.017	0.122 (0.017)***	0.124
nl2	0.015 (0.0006) ***	0.016	0.156 (0.019)***	0.128
nl3	0.044 (0.001) ***	0.048	0.058 (0.019)***	0.042
nl4	0.012 (0.0007) ***	0.012	0.107 (0.014)***	0.090
pt1	-0.057 (0.004) ***	-0.056	-0.001 (0.020)	0.049
pt2	-0.063 (0.006) ***	-0.059	-0.037 (0.031)	0.032
pt3	-0.077 (0.005) ***	-0.075	-0.085 (0.028)***	-0.062
uke	0.018 (0.001) ***	0.016	-0.002 (0.034)	-0.051
ukf	0.015 (0.001) ***	0.013	0.002 (0.021)	-0.023
ukg	0.009 (0.001) ***	0.007	-0.055 (0.02)***	-0.088
ukk	0.025 (0.001) ***	0.027	-0.011 (0.022)	-0.013
ukl	0.023 (0.001) ***	0.022	-0.094 (0.017)***	-0.083
ukm	0.024 (0.001) ***	0.024	-0.043 (0.019)**	-0.065
ukn	0.018 (0.001) ***	0.019	-0.040 (0.019)**	0.038

Table 5: Industry-Mix and competitive effects in NUTS1

From observation of table 5 it can be noticed that in general terms both sectoral and regional effects result to be significant when considered separatedly in the explanation of the evolution of the NUTS1 employment.

The comparison of the sectoral and regional effects shows that in 45 out of the 58 considered regions the computed sectoral effect appears to be higher (in absolute terms) than the regional effect.

The obtained results also suggest the existence of some common structures between the spanish and greek effects and also between those observed in Denmark, Germany and United Kingdom. A detailed analysis of these common patterns should be considered in further research.

6. Concluding remarks

The present paper has shown the usefulness of traditional and stochastic shift-share formulations in the sectoral and regional analysis of the european employment evolution.

The application of these techniques to the european countries and regions (NUTS1 and NUTS2) provides a vast amount of information whose synthesis has been presented in the previous section. According to these empirical findings some concluding remaks can be emphasized: on the one hand, substantially different effects have been found for agriculture, industry and service employment; on the other hand, the impact of the industry-mix appears to be lower than the one related to the competitive effect.

Nevertheless, we should point out that these conclusions depend to a great extent on the considered territorial and sectoral units, and therefore conclusions could change when different aggregations are assumed.

Finally, it must be noticed that the present analysis is referred to the whole decade 1990-2000 and that a more detailed study for some specific subperiods would be advisable.

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